



Outline of course on:

## “Quantitative Public Policy Analysis”

**Instructors:** Prof. Bruno Cautrès, Sciences Po, Paris

### Week 1

#### Overview

Whether you think they should or they should not, numbers, data, and quantitative methods matter to today's public policy and policy analysis. Policymakers and administrators alike use numbers to support their (normative) arguments on what policies should be implemented, whether governments should or should not provide certain services, or whether it is the right time to engage in policy reform. At the same time, policy analysts use data and wide variety of quantitative methods to predict and evaluate the success or failure of new policies and to engage in evidence-based research on the impact of past policy interventions.

This course is the first part in a two-course sequence (cf. Quantitative Public Policy II). It is designed to provide participants with the basic skills needed to engage with quantitative policy reports and publications, familiarizes them with fundamental quantitative methods, and teaches them how to use some of the statistical tools required for a successful career in today's public policy world.

#### Description

This first course is the first week of the two-weeks course “Quantitative Public Policy Analysis” sequence (cf. Quantitative Public Policy week 2). The first week introduces participants to the major concepts and tools used by public policy specialists for causal reasoning and the quantitative evaluation of policies. Among the concepts covered by the course are counterfactuals, potential outcomes, treatment effects, before-after effects. Participants also learn how statistical methods (regression-based methods) can be used to develop a formal framework for quasi-experimental reasoning and to address major public policy questions related to such diverse issues as education, public health, social policies, business regulation, etc. This first week do not require previous knowledge in statistics even if a basic knowledge (descriptive statistics and hypothesis testing) facilitates the things. In case very beginners would participate, it would be a good thing to attend the crash-course in basic statistics before.

The first week is organized like this : the beginnings of the course focuses on the role of quantitative methods in public policy analysis and evaluation and theoretical considerations behind (correlation versus causality; the potential outcomes and the Rubin causal model; experiments and quasi-experiments versus observations; internal/external validity); the rest of the week is more applied in showing how regression-based methods can provide an empirical framework to test for causal effect when data come from observations rather than experiments. The key point will be to learn the participants why and how the regression-based methods are used to identify the so-called “treatment effect”, in other words the prove that the policy has or not the effects it is supposed to have. This simple question (has the public policy change the expected effects? does it improve the things ?) is a source for tricky methodological problems for which we need regression-based methods.



Participants will learn the basics of the classic linear regression model and how to use regression to test the effect of such 'treatments' as a change in policy or exposure to political reform. We study a variety of techniques within the multiple regression framework – dummy variables, interaction effects, Chow test for subgroups and structural breaks – that allows us to use regression for group comparisons. By the end of the course, participants will not only have a clear understanding of the relationship between the comparison of treatment and control groups and regression, but to conduct their own, basic quantitative analyses of social, political, or economic data and to evaluate public policies with the help of the popular statistical software Stata.

### **Prerequisites**

There are no formal prerequisites for this course. Basic knowledge of descriptive statistics and a background in the use of the statistical software Stata, as provided by the introduction to Applied Data Analysis are helpful but not required. Depending on the previous knowledge of the students, the syllabus can be slightly adapted.

### **Readings and day-by-day outline**

Most of the readings will be made available through the web of summer school. Students does not need to buy a book, unless some introduction to basic statistics. Some small modifications of the readings list could be done, in advance of the summer school.

#### **Day 1 - Introduction: Presentation of the class, general introduction, The role of quantitative analysis in public policy analysis and evaluation, basic notions and introduction to statistics**

##### *Required readings*

\*\* Joel Best. 2004. *More Damned Lies and Statistics: How Numbers Confuse Public Issues*, (Berkeley: University of California Press, 2004), in particular chapter 6 “Contentious Numbers”.

##### *Supplementary readings (if you need a basic recall in descriptive statistics and hypothesis testing)*

\*\* Alan Agresti, Barbara Finlay. *Statistical methods for social sciences*, Pearson, 2009; chap 2 to 7 are good introduction and to basic statistics

#### **Day 2 - Correlation/Causality, Potential Outcomes and the Rubin model**

##### *Required readings (one of the two must be read)*

Dunning, Thad (2008). *Improving Causal Inference. Strengths and Limitations of Natural Experiments*, *Political Research Quarterly*, 61:2, pages 282-293

David Freedman. *From Association to Causation: Some Remarks on the History of Statistics*. *Statistical Science*, 14(3), 1999, p.2 43–258.

##### *Supplementary readings (if you want more during or after the summer school)*

Debbie A. Lawlor, George Davey Smith, K. Richard Bruckdorfer, Devi Kundu, and Shah Ebrahim. *Those Confounded Vitamins: What Can We Learn from the Differences between Observational versus Randomised Trial Evidence?* *The Lancet*, 363:1724–1727, 2004.

Jeffrey G. Johnson and al. “Television Viewing and Aggressive Behavior During Adolescence and Adulthood”, *Science*, 29 March 2002, Vol. 295, pp. 2468-2471



### **Day 3 – Statistical association, comparison of groups, correlation: basic tools for quantitative analysis of policy and political data**

*Required readings (one of the two must be read)*

Jeffrey G. Johnson and al. "Television Viewing and Aggressive Behavior During Adolescence and Adulthood", *Science*, 29 March 2002, Vol. 295, pp. 2468-2471

David L. Strayer and William A. Johnston, "Driven to Distraction: Dual-Task Studies of Simulated Driving and Conversing on a Cellular Telephone", *Psychological Science*, vol. 12 (6), November 2001, pp. 462-466

*Supplementary readings (if you want more during or after the summer school)*

Uchikoshi, Y. (2005). Narrative development in bilingual kindergarteners: Can Arthur help? *Developmental Psychology*, 41(3): 464-478

### **Day 4 - Multiple linear regression model as a general framework for testing differences: regression with dummies and interactions as a first approach to test for treatment effect**

*Required readings (Gujarati is obligatory if you are beginners in regression, but strongly recommended for others)*

Damodar Gujarati. *Basic econometrics*, 4th ed., pages 37 to 51 (compulsory), pages 58 to 64 (compulsory), pages 65 to 79 (recommended), pages 81 to 87 (compulsory), pages 127-139 (compulsory)

Jaffee, SR, Moffitt, TE, Caspi, A, & Taylor, A (2003). Life with (or without) father: The benefits of living with two biological parents depend on the father's antisocial behavior. *Child Development*, 74(1) 109-126.

*Supplementary readings (if you want more during or after the summer school)*

Damodar Gujarati. *Basic econometrics*, 4th ed., pages 217-223, pages 248-265, p.273-279, pages 297-303, pages 304-311

Thrane Christer (2004). In defence of the price hedonic model in wine research, *Journal of Wine Research*, 15: 2, pages 123 — 134

Joseph P. Newhouse. 1977. "Medical-Care Expenditure: A Cross-National Survey," *Journal of Human Resources*, 12: 1 (Winter, 1977), pp.115-125. Available through <http://www.jstor.org>

Laurence J. O'Toole Jr. and Kenneth J. Meier. 2004. "Parkinson's Law and the New Public Management? Contracting Determinants and Service-Quality Consequences in Public Education," *Public Administration Review*, 64:3 (June, 2004), pp. 342-352. Available through <http://www.jstor.org>

### **Day 5 - Chow test as a first approach to test for discontinuities design effect**

*Required readings (one of the two must be read)*

Howard B. Lee. Using the Chow Test to Analyze Regression Discontinuities. *Tutorials in Quantitative Methods for Psychology*, 2008, Vol. 4 (2), p. 46-50.

Damodar Gujarati. Use of Dummy Variables in Testing for Equality between Sets of



Coefficients in Two Linear Regressions: A Note. *The American Statistician*, Feb. 1970, pp. 50-52

#### *Supplementary readings*

Alfred DeMaris. *Regression with social data : modelling continuous and limited response variables*. Wiley, NJ, 2004, pp. 148-154

## Week 2

### Overview

Whether they should or they shouldn't, numbers, data and quantitative methods matter in policy and in policy analysis. Policy and political analysts use numbers treated with quantitative methods in evidence-based research about whether policy interventions are successful. Policymakers use numbers to support (sometimes normative) arguments about whether government should (or should not) provide particular services or engage in policy change and reforms. This is the second course in a two-course sequence designed to teach you the quantitative methods that you need for a career in public policy and also to be able to read publications using these methods. By this we mean the application of statistical methods to problems in political science and public policy

### Description

Building on the first course which covered basic concepts, notions and introduction to regression based reasonings, this second module provides a survey of more advanced empirical tools for political science and public policy research. The focus is on statistical methods for causal inference, i.e. methods designed to address research questions that concern the impact of some potential cause (an intervention, a change in institutions, economic conditions, or policies) on some outcome ( vote choice, income, election results, crime rates, etc).

We cover a variety of causal inference designs, including quasi-experiments, advanced regression, panel methods (fixed and random effects), difference-in-differences, instrumental variable estimation, regression discontinuity designs, quantile regression. We will analyze the strengths and weaknesses of these methods. Applications are drawn from various fields including political science, public policy, economics, and sociology.

We begin by discussing the strengths and limitations of multiple regression analysis and the relationship between regression and causal modeling. We then develop a sequence of extensions and alternatives, including : regression discontinuity, difference-in-differences, panel data, instrumental variables. The course will conclude with an introduction to some limited dependent variables techniques that are now common in political and policy analysis due to the categorical nature of many phenomena treated by political and policy analysis (binary and ordinal logit analysis).

We will learn both the techniques and how to apply them using data sets. Skills students will acquire in this course include: the capacity to reason causally and empirically, the ability critically to assess empirical work, knowledge of advanced quantitative tools, and experience in working with data sets.



## Prerequisites

Background knowledge of multiple regression models, such as the Basics of Quantitative Methods for Public Policy Analysis course offered in week 1, or the equivalent. As the course will use Stata as the software, a background in using this software is helpful, but not required. Lab sessions will include replication of some published papers that will permit participant to acquire practical skills for working with empirical data.

Students does not need to buy a book, unless some introduction to basic statistics.

## Day 1 - Difference in Differences: natural experiments for exogenous treatment

*Required readings (one of the two must be read)*

Dynarski, Susan M. 2003. "Does Aid Matter? Measuring the Effect of Student Aid on College Attendance and Completion. *The American Economic Review*, 93(1): 279-288

David Card and Alan B. Krueger. Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania. *The American Economic Review*, 90(5):1397–1420, 1994

*Supplementary readings (if you want more during or after the summer school)*

Esther Duflo (2001), "Schooling and Labor Market Consequences of School Construction in Indonesia: Evidence from an Unusual Policy Experiment," *American Economic Review*, 91(4): 795-913.

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

## Day 2 - Instrumental Variables

*Required readings (one of the three must be read)*

Dee, Thomas S. 2004. "Are there Civic Returns to Education?". *Journal of Public Economics* 88:1697-1720.

Levitt, Steven D. 1996. "The Effect of Prison Population Size on Crime Rates: Evidence from Prison Overcrowding Litigation." *Quarterly Journal of Economics*, 111(2): 319-51

Greenland S. An introduction to instrumental variables for epidemiologists. *International Journal of Epidemiology*, 2000;29:722-729

*Supplementary readings (if you want more during or after the summer school)*

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

Newhouse JP, McClellan M. Econometrics in Outcomes Research: The Use of Instrumental Variables. *Annual Review of Public Health*, 1998;19:17-34.

Michael Foster. (2000) "Is more better than less? An analysis of children's mental health services" *Health Services Research*. Chicago: Vol. 35, Iss. 5; p. 1135



### **Day 3 – Regression discontinuity designs**

*Required readings (one of the three must be read)*

Thistlethwaite, Donald L., and Donald T. Campbell. 1960. "Regression-Discontinuity Analysis: An Alternative to the Ex Post Facto Experiment." *Journal of Educational Psychology*, 51(6): 309–17.

S. Black (1999), "Do Better Schools Matter: Parental Value of Elementary Education," *Quarterly Journal of Economics*, 114, 577-599.

Basten and Betz (2013). "Beyond Work Ethic: Religion, Individual, and Political Preferences." *American Economic Journal: Economic Policy*, 5(3), 67-91

*Supplementary readings (if you want more during or after the summer school)*

Devin Caughey and Jasjeet S. Sekhon. Elections and the Regression Discontinuity Design: Lessons from Close U.S. House Races, 1942–2008. *Political Analysis*, 19(4):385–408, 2011

Shadish, Cook & Campbell (2002) "Regression Discontinuity Designs" Chapter 7 in *Experimental and Quasi-Experimental Designs* Boston: Houghton Mifflin Co.

### **Day 4 - Analyzing categorical policy preferences and utilities: binomial logistic regression**

*Required readings (one of the two must be read)*

Menard, Scott. *Applied logistic regression analysis* (second edition). Sage Publications, (Quantitative Applications in the Social Sciences, 106), p. 1-24, 41-61

DeMaris, Alfred. A Tutorial in Logistic Regression. *Journal of Marriage and Family*, Vol. 57, No. 4 (Nov., 1995), pp. 956-968

### **Day 5 - Analyzing ordered policy preferences and utilities : latent preferences measured by ordinal and multinomial logits**

*Required readings (one of the three must be read)*

O'Connell, Ann. Logistic regression models for ordinal responses variables. Sage Publications, 2006. (Quantitative Applications in the Social Sciences, 146), p. 27 54  
Supplementary readings

Agresti, Alana. *Analysis of Ordinal Categorical Data* (second edition), New York, John Wiley, 2010, chapter.