Department of Psychological and
Behavioural Science

PB4A7: Quantitative Applications in Behavioural Science

Fall Semester

Instructor:	Dr. George Melios	**Time:**	Tuesday 09:00-10:00
E-mail:	G.Melios@lse.ac.uk	**Room:**	MAR. 1.04
Office:	CON 5.19	**Seminars:**	11:00-14:00
Office Hours	Wednesdays 11:00-12:00	**Room:**	FAW.4.02
Teaching Ass.:	Lazaros Chatzilazarou	**Office Hours:**	On Student Hub
E-mail:	l.a.chatzilazarou@lse.ac.uk	**Help Sessions**	Tue 16:00-18:00 / CBG.G.01

Course description: Quantitative data collection is an integral component of behavioural science: Testing hypotheses requires designing experiments and analysing the data or performing statistical analyses on secondary data. Whereas another core course in this programme - Experimental Design and Methods for the Behavioural Science - covers best practices in designing and conducting experimental research, Quantitative Applications for Behavioural Science introduces the main statistical background of behavioural research from psychology and economics. The course will cover best practices and state of the art statistical tools that are used by psychologists and economists. All the analyses will be demonstrated on example behavioural science research, and students will learn how to identify, interpret, and evaluate appropriate analyses for different research designs, conduct their own data analysis for each of these designs as well as report the analysis for publication in a journal, and recognise and understand contemporary issues in data science analysis in psychology and economics that need to be considered for best research practices. Emphasis will be on teaching students how the same analyses are presented in psychology and economics journals so students can understand how to integrate research from these two fields that constitute behavioural science.

Requirements: Download and install STATA or R and R Studio. Throughout the class, we will rely on STATA for seminars but codes will be provided for R as well.

Student hours: You can book office hours for Dr. Melios & for Mr Chatzilazarou via Student Hub.

Class attendance and participation: The learning process of this class is based on in-class discussion and participation. Attendance and careful preparation of the course material is therefore highly recommended. This includes coming to class on time.

Material: There is a number of great websites, books, online videos and podcasts that provide interesting information in addition to the Lectures. Some of them we will use as Required or Optional readings for the course. An indicative (but not exhaustive list):

- The Effect book & Codes (Open Access) by Nick C. Huntington-Klein
- Causal Inference Mixtape book & Codes (Open Access) by Scott Cunningham
- Introduction to Econometrics, Global Edition by James H. Stock & Mark W. Watson 2019
- Thinking clearly with data by Ethan Bueno de Mesquita & Anthony Fowler (2021)
- Mostly Harmless Econometrics by Joshua Angrist & Jorn-Steffen Pischke
- Stata coding Cheat sheets
- R coding Cheat sheets

Assessment: The summative assessment comprises two parts, 1) a data analysis report replicating an existing paper (worth 70%), and 2) a poster summarising the main components of the report (worth 30%).

For the report, everyone will work on replicating the same academic journal article. You will also be provided with a cleaned dataset to use for data analysis. The goal is to first replicate the main analyses of the paper on your own, not using any code that may be provided by the authors, and to provide tables and charts as close to those shown in the paper. After successfully replicating, you should provide any critiques of the paper, including for example whether you caught any mistakes, why you disagree with any assumptions or methodological approaches, and its strengths and limitations. If you could not replicate an analysis, provide a best attempt at doing so, and discuss why it might have been unsuccessful. Finally, you should think through extensions to the paper, including how future studies might build on the findings, or other analyses that can be done with the existing data.

The poster will draw from your work in the report, but in a more approachable and compelling format. You can use the guidelines on how to create a conference poster, but this exercise should

also be a creative pursuit, so no need to stick to strict formatting rules. That said, the poster must be logically laid out and easy to follow (i.e., think about the viewer's experience) and should be as analytical and well-researched as it is visually appealing.

Deadline: 23/01/2024 (LT week 2)

Course outline:

In this syllabus we mark required readings as (📖), optionals as * and CheatSheets as (💡). Required readings are essential to read every week. All other resources should help you if you need further input or want to expand your knowledge.

Week 0: Preparation

Before starting with the course, we will have an introductory/preparatory session on statistics so that we can depart from a similar level.

📝 Presessional statistics

📖 Required Readings

- ☐ Chapters 1 & 2 from from The Effect book
- ☐ Presessional lecture notes

Week 1: Introduction

This session will introduce you to the concept of applied quantitative research in general, give a brief outline of the course, and address organizational issues. We will then have a short followup to themes discussed during the presessional.

📖 Required readings

- ☐ Continue Chapters 1 & 2 from The Effect book

Optional readings

- * The Credibility Revolution in Empirical Economics: How Better Research Design Is Taking the Con out of Econometrics

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Week 2: Linear Regressions / OLS

In week 2 we will start looking at how we can use data to describe relationships between two variables

Required readings

- ☐ Chapters 3 & 4 from The Effect book

Week 3: Hypothesis Testing

In Week 3, we will explore how we can use formal procedures to examine if two opposing claims or hypothesis are true or not.

Required readings

- ☐ Chapter 5 from The Effect book

Week 4: Linear Regressions with multiple regressors

In Week 4, we will build on Linear regressions by expanding our analysis using multiple regressors

Required readings

- ☐ Chapter 13 (except 13.3 + 13.4) from The Effect book

Week 5: Binary Variables & Non Linear Functions

In Week 5 we will focus on non-linear functions and OLS violations

Required readings

- ☐ Chapter 13 (incl. 13.3 + 13.4) from The Effect book

Week 6: Reading Week

No lectures and seminars this week

Week 7: Counterfactual World

In week 7, we will focus on how we analyse and interpret binary independent variables

Required readings

- ☐ Chapters 5, 10 & 11 from The Effect book

Optional readings

- ☐ Chapters 6-9 from The Effect book
- ∗ Chapters 1 & 4 from Causal Inference Mixtape Book

Week 8: Panel Regression Models

Week 8 will focus on how to approach and analyse panel data. We will cover Fixed Effects estimators and issues of endogeneity in panel estimators

📚 Required readings

- ☐ Chapters 16 from The Effect book

Seminar readings

- ∗ Ayres, I. and Donohue, J.J., 2002. Shooting down the more guns, less crime hypothesis.

Week 9: Regression Discontinuity Design

This week, together we will look into Regression Discontinuity Design and the paper of Hansen that is the core part of your assignment.

📚 Required readings

- ☐ Chapters 20 from The Effect book
- ☐ Chapters 6 from Causal Inference Mixtape Book

Seminar readings

- ∗ Hansen, B., 2015. Punishment and deterrence: Evidence from drunk driving. American Economic Review

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Week 10: Instrumental Variables

We will dedicate this week to estimating causal parameteres through Instrumental Variables. First we will approach the concept of instruments through Direct Acyclical Graphs (DAGs) and then through the LATE effect (Local Average Treatment Effect).

📚 Required readings

- ☐ Chapters 6-8 & 19 from The Effect book
- ☐ Chapters 7 from Causal Inference Mixtape Book

Seminar readings

- Card, D., 1993. Using geographic variation in college proximity to estimate the return to schooling.
- Klein Teeselink & Melios (2021) - Weather to Protest: The Effect of Black Lives Matter Protests on the 2020 Presidential Election

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Week 11: Difference in Difference Estimators

Guest lecture! *This week, together with Prof. George Kavetsos we will look into practical examples of Diff-in-Diff*

In the last week we will focus on causal inference through Difference in Difference estimators. First, we will decompose the mechanics and conditions of Diff-in-Diff estimators and then we will briefly discuss current methodological debates and advances.

Required readings

- ☐ Chapters 18 from The Effect book
- ☐ Chapters 9 from Causal Inference Mixtape Book

Additional readings

- Card & Krueger, 1993 - Minimum Wages and Employment: A Case Study of the Fast Food Industry in New Jersey and Pennsylvania