

## **Advanced Econometrics: Panel Data**

**Arthur van Soest, Tilburg University**

### **Objectives**

The aim of the course is to give a broad overview of empirical models used to analyse panel data, with a focus on applications in microeconomics, explaining the agents' economic decisions or outcomes. The main econometric models and methods for panel data will be discussed, and the students will do hands on exercises in order to learn how to apply the techniques in empirical applications such as, possibly, their own research.

### **Content**

Economic agents often make similar decisions repeatedly over time, taking account of changes in prices and other factors driving preferences, opportunities, or expected outcomes. Examples are consumption expenditures, savings and portfolio choice, or investment decisions in housing of private households; labour force participation and labour supply decisions, decisions on smoking, drinking and other kinds of health related behaviour of individuals, etc. Similarly, firms have to decide on hiring and firing, investing in human capital (by training their workers) or physical capital and in research and development, etc.

To analyze how economic agents make these decisions and the consequences of these decisions, empirical researchers make more and more use of panel data techniques. Panel data are data in which decisions of many economic agents are observed several times, usually at different points in time. For example, many socio-economic household surveys have data on wealth and household assets for a number of consecutive years, allowing for an analysis of the determinants of decisions to buy life insurances or other specific retirement plans, stocks and bonds, etc. Panel data techniques are also useful for the analysis of economic experiments where the same subjects make a number of consecutive decisions in the same experiment.

This course presents theory and applications of panel data models, focusing on models that explain decision making by individuals, households, or firms. Students will learn the main econometric models and techniques for estimation, testing and model selection. They will study articles that apply these models and techniques to a variety of micro-economic issues. In addition, they will learn how to apply these models and techniques themselves by doing exercises and assignments using STATA.

Applications will come from labour economics, economics of consumer behaviour, development economics, environmental economics, savings and portfolio choice, and health economics.

### **Recommended Reading**

- M. Verbeek, *A Guide to Modern Econometrics* (4<sup>th</sup> edition), Wiley, Chichester, (2012). Particularly Chapter 10 and parts of the earlier chapters
- A.C. Cameron and P.K. Trivedi (2005), *Microeconometrics: Methods and Applications*, Cambridge University press, New York. Particularly Chapter 23.
- A selection of applied articles (to be announced).

### **More Advanced Reading for Interested Students:**

- B. Baltagi, *Econometric Analysis of Panel Data* (5<sup>th</sup> edition), Wiley, Chichester, (2013).
- J.W. Wooldridge, *Econometric Analysis of Cross Section and Panel Data* (2<sup>nd</sup> edition), MIT Press, Cambridge MA, (2010).
- M. Arellano and B. Honoré (2001), Panel data models: some recent developments, in J. Heckman and E. Leamer (eds.), *Handbook of Econometrics Volume 5*, North-Holland, Amsterdam, pp. 3229-3296.

### **Required Prerequisites**

A solid introductory course in econometrics; preferably some basic knowledge of Stata

### **Schedule**

There will be a short welcome meeting at 19:00 on Sunday, followed by dinner

The daily schedule for Monday – Thursday will be:

7:00 - 9:00 Breakfast

9:00 - 10:30 First session (lecture)

10:30 - 11:00 Coffee break

11:00 - 12:30 Second session (lecture)

12:30 - 14:00 Lunch break  
14:00 - 15:30 Third session (computer class)  
15:30 - 16:00 Coffee break  
16:00 - 17:30 Fourth session (computer class & wrap up)  
17:30 - 19:00 Free time  
19:00 Dinner

The schedule for Friday will be the same except that we stop at 14:00 so that there is enough time to travel back home.

### **Overview**

The morning sessions will be devoted to the econometric models and techniques, with some applications to illustrate these. In the afternoon sessions, students will use Stata to do their own empirical analysis using case studies.

*Note: For the computer classes, participants are expected to bring their own laptop with Stata installed. If this is not possible, please indicate this upon registration.*

### **Provisional day-to-day program**

Day 1: Static linear panel data models with random effects or fixed effects; GLS, WG and FE-IV estimation; Hausman test

Day 2: Dynamic linear panel data models; GMM and the Arellano-Bond and Blundell-Bond estimators

Day 3: Static and dynamic binary choice models with random and fixed effects; ML and Conditional ML estimation

Day 4: Censored regression models; ML estimation for random effects models and Honoré's estimators for fixed effects models

Day 5: Some discrete choice models for panel data (Multinomial choice, ordered choice, count data models); ML and Conditional ML estimation