Multilevel 1: Introduction to multilevel models

Week 2 (Regular course)

Duration: 12 hours/3 days

Course Description

The course introduces the concepts of multilevel analysis, whose main aim is to model the relationships between and within groups. Typical situations include individuals clustered into families, schools, firms, geographical areas. The course focuses on the two-level linear model as a template to illustrate issues of specification, estimation and inference. The main ideas are illustrated through case studies. A typical field of application is education, where students are clustered into schools: the first case study aims at assessing the role of student and school factors on student achievement. Another relevant field of application of multilevel models is the analysis of cross-country data such as the European Social Survey: the second case study concerns political trust in Europe, considering individual and country-specific characteristics. The case studies are worked out with Stata. Moreover, each lesson includes guided exercises using Stata. Special attention is devoted to critical and controversial issues, such as group-mean centering of the covariates, sample size requirements, choosing between fixed and random effects, and using sampling weights.

Software

Stata 17 (or older versions starting from v.15)

Prerequisites

Basic knowledge of statistical inference and linear regression. Knowledge of Stata is helpful but not necessary (files with commands are always provided).

Schedule

Day 1

Basics of multilevel analysis: theory

Basics of multilevel analysis: case study 1

Day 2

Model specification, estimation and inference: theory

Model specification, estimation and inference: case study 2

Day 3

Fixed and random effects, complex structures, weighting

Review and further examples

References

• Grilli L., Rampichini C. (2018). A handful of critical choices in multilevel modelling. Boletín de Estadística e Investigación Operativa, 34 (1).

• Hox J.J., Moerbeek M. and van de Schoot R. (2017). Multilevel Analysis: Techniques and Applications, Third edition, Routledge

• Rabe-Hesketh S. and Skrondal A. (2022). Multilevel and longitudinal modeling using Stata, Fourth edition, Stata Corp.

• Snijders T.A.B. and Bosker R.J. (2012). Multilevel Analysis: An introduction to basic and advanced multilevel modeling, Second edition, Sage.

Short biography

Leonardo Grilli, PhD, is Full Professor of Statistics at the University of Florence and Director of the Master program in Statistics and data science. He is a member of the board of the Doctoral Program in Development Economics and Local Systems at the University of Florence. His teaching activity focuses on introductory statistics and statistical modelling, including generalized linear models and multilevel models. His research mainly concerns random effects models for multilevel analysis, with methodological advances about the specification and estimation of models in complex frameworks such as duration data, multivariate qualitative responses, informative sampling designs, and sample selection bias. He also gave contributions regarding causal inference in the potential outcomes framework, IRT models, latent growth curve models, mixture models, and quantile regression. The methodological work is driven by applications on real data in different fields mainly in the social sciences, but also in demography and medicine.

Carla Rampichini, PhD, is Full Professor of Statistics. She is Head of the Department of Statistics, Computer science, Applications of the University of Florence. She is a member of the board of the Doctoral Program in Development Economics and Local Systems at the University of Florence. Her teaching activity focuses on introductory statistics, multivariate analysis and statistical modelling, including generalized linear models and multilevel models. Her research interests relate to random effects models for multilevel analysis, program evaluation, and causal inference. Her methodological work is joined with applications on real data, often concerning the effectiveness of universities. She is member of the Royal Statistical Society and of the Italian Statistical Society. She is the editor of Statistical Methods and Applications and she has served as referee for many national and international journals.