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Fixed effects or random effects: an empirical application?

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Background

Any analysis of school effects on pupil attainment is hierarchical with pupils nested in schools. Estimation of hierarchical regression models can be done by treating school effects as fixed or random. Currently, the choice of approach appears to be based on each discipline's dogma: economists tend to use fixed effects, with education researchers preferring random effects.

Research Questions

We ask: what impact does choice of model have when modelling pupil attainment in primary school? The two models considered in this paper are random effects (multi level models) and fixed effect models.

To illustrate the potential biases arising from choice of model we consider the impact of free school meals (FSM) and special educational needs (SEN) on pupil attainment.

Methods

Our aim is to show that this choice should be application-specific, and to highlight the criteria that should be used. We hope to convince economists that they should not write-off the random effects approach because many of its weaknesses can affect fixed effects approaches equally as badly, and it allows more flexible modelling strategies to be used to ameliorate these problems. We additionally hope to make education researchers more aware of the issues concerning economists which limit the use of analytical results to inform policy decisions unless adequately addressed; in particular, results from analyses based on limited official data sources with a limited range of variables should be treated as descriptive unless strong counter-arguments can be proposed.

Frame

The paper compares fixed effect versus random effect models using empirical analysis of the Avon Longitudinal Study of Parents and Children. Simulation data is also used to illustrate the issues around the assumptions behind both models on questions of selectivity.

Research findings

This paper contributes to multi disciplinary understanding and research by identifying the assumptions behind the models being used by different disciplines and discussing which model might be most appropriate in a specific context. The paper also illustrates in a number of specific empirical contexts that choice of model does not necessarily produce very large differences in coefficient estimates, depending on the data available. The paper is therefore a useful practical guide for the education researcher, regardless of discipline, who wants to model pupil achievement. We also hope that it will further encourage researchers to consider and cite evidence from different disciplines and methodological traditions on the same issue.