Fixed/random Effects Analysis of Repeated Measures Data

Introduction

- Panel data analysis and the challenge of unmeasured confounding
- Fixed and random effects models for causal estimation
- Objective: Explore how fixed and random effects models perform under different conditions

Simulation Design

Three data generating processes (DGPs):

- 1. Time-invariant confounding with no correlation between the confounder and treatment variable.
- 2. Time-invariant confounding with a correlation between the confounder and treatment variable.
- 3. Time-varying confounding with a correlation between the confounder and treatment variable.

Union membership and worker's wage as the research question

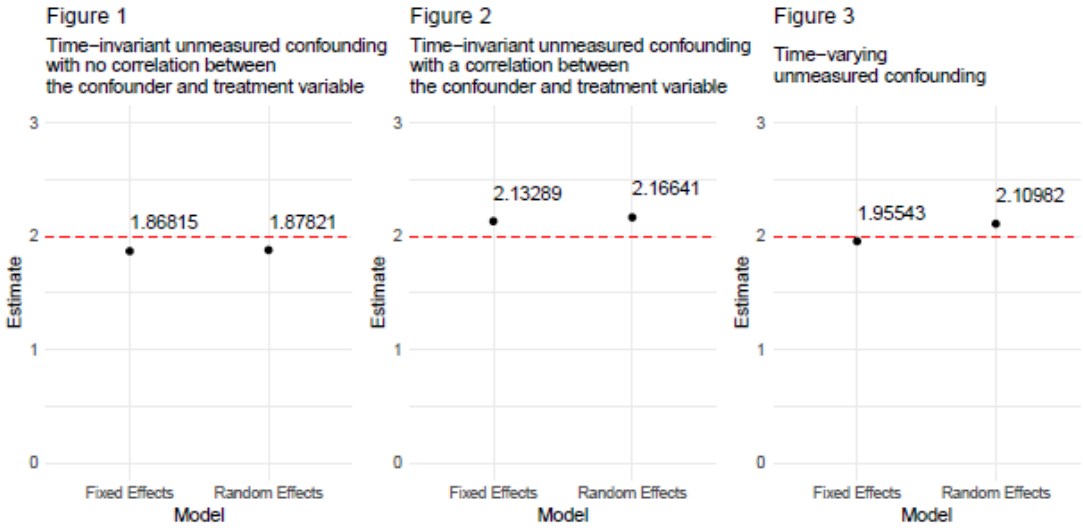
- Four scenarios with different numbers of individuals (N) and time points (T)Panel data analysis and the challenge of unmeasured confounding:
  - small N and small T;
  - small N and large T;
  - large N and small T;
  - large N and large T.

Main Findings

- Time-invariant unmeasured confounding with no correlation
- Time-invariant unmeasured confounding with a correlation
- Time-varying unmeasured confounding
- Effects of N and T on fixed and random effects models

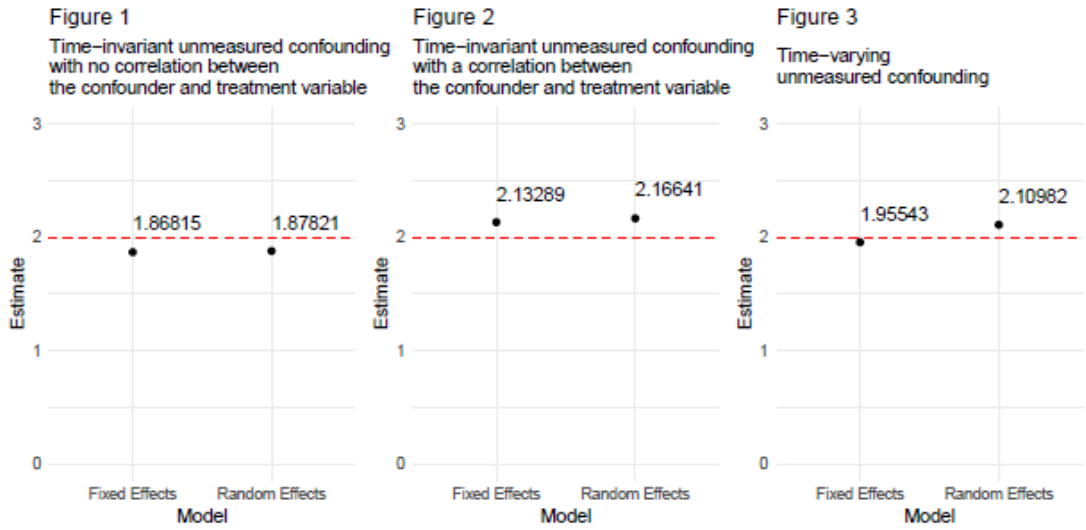
Time-invariant unmeasured confounding with no correlation

- Both fixed and random effects models perform well
- Random effects model is more reasonable, as it estimates the effects of time-invariant variables



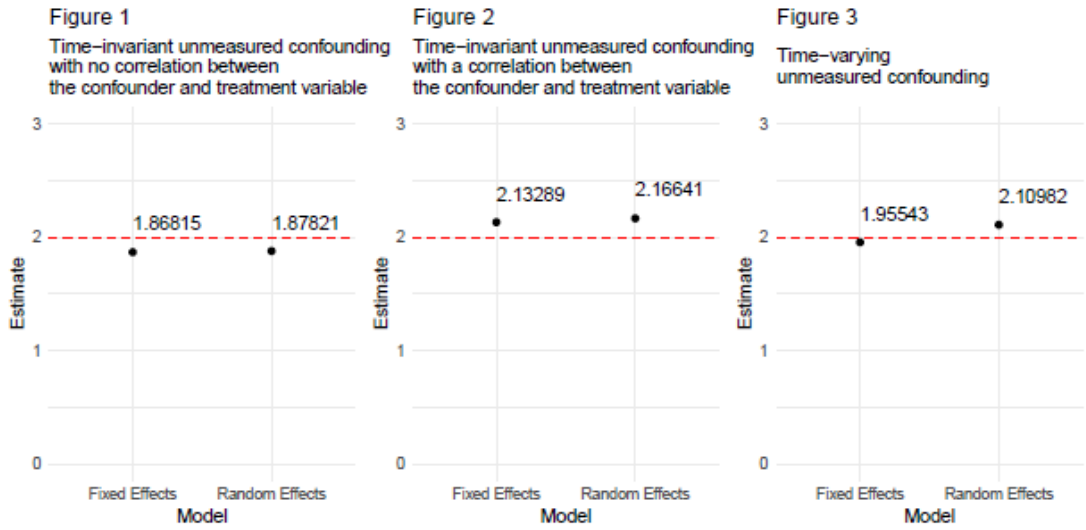
Time-invariant unmeasured confounding with a correlation

- Fixed effects model performs better
- Random effects model may not fully control for confounders and can be biased



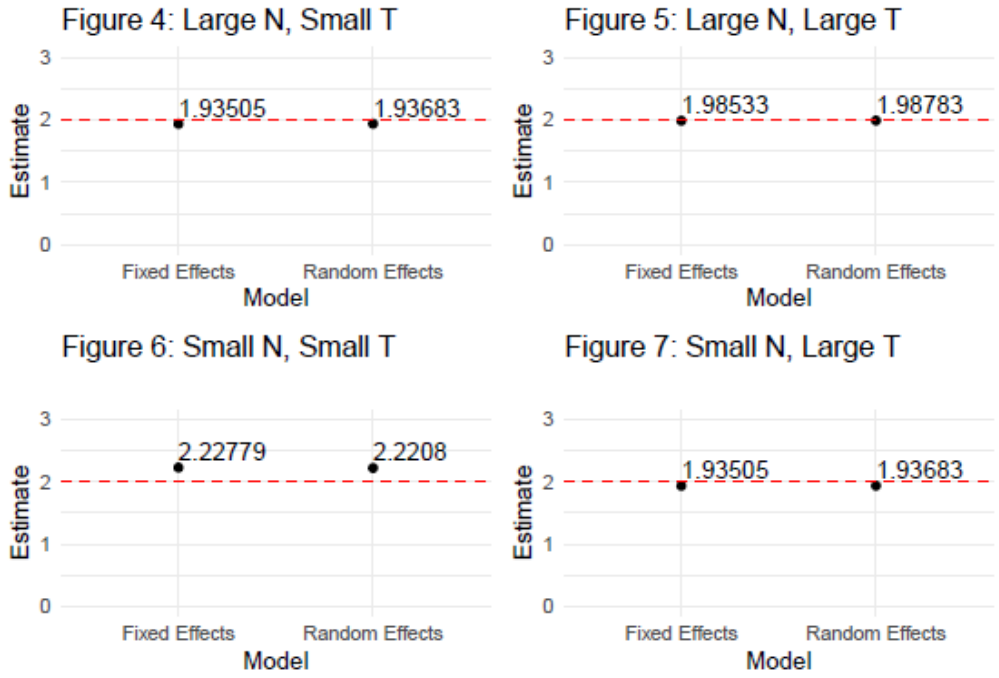
Time-varying unmeasured confounding

- Fixed effects model cannot control for time-varying confounding
- Random effects model may be biased if confounder is correlated with treatment variable
- Additional techniques required, such as instrumental variables



Effects of N and T on fixed and random effects models

- Fixed effects model performs better in scenarios 1, 3, 4
- When N and T are large, fixed and random effects models perform similarly
- Random effects models are preferred when N is small and T is large



Conclusions

Fixed effects models: effective in controlling time-invariant unmeasured confounders, best with large N

Random effects models: more efficient and flexible when dealing with multiple time points, best with small N and large T

Complex models needed for unmeasured time-varying confounders