Dynamic Biases of Static Panel Data Estimators

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Abstract

This paper identifies an important bias — termed dynamic bias — in fixed effects panel estimators that arises when dynamic feedback is ignored in the estimating equation. Dynamic feedback occurs if past outcomes impact current outcomes, a feature of many settings ranging from economic growth to agricultural and labor markets. When estimating equations omit past outcomes, dynamic bias can lead to significantly inaccurate treatment effect estimates, even with randomly assigned treatments. This dynamic bias in simulations is larger than Nickell bias. I show that dynamic bias stems from the estimation of fixed effects, as their estimation generates confounding in the data. To recover consistent treatment effects, I develop a flexible estimator that provides fixed-T bias correction. I apply this approach to study the impact of temperature shocks on GDP, a canonical outcome where economic theory points to an important feedback from past to future outcomes. Accounting for dynamic bias lowers the estimated effects of hotter years on GDP growth by 10% and GDP levels by 120%.

Keywords: treatment effects, fixed effects panel model, dynamic panel model, climate economics, environmental dynamics

JEL classification: C33, Q51

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