When do we need to deviate from the two-way fixed effects regression?

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Abstract

The widespread use of the two-way fixed effects regression has come under scrutiny recently due to results from Chaismartin and D'Haultfoeuille (2020) and Goodman-Bacon (2021) suggesting that it fails to uncover meaningful averages of heterogeneous treatment effects under the presence of effect heterogeneity over time and across adoption cohorts. In this paper, we propose a simple test that can be used to test for differences in dynamic treatment effects over cohorts, which allows us to test for when the two-way fixed effects regression is likely to yield biased estimates of average treatment effects on the treated (ATT)s.

Keywords: difference in differences, panel data, heterogeneous treatment effects

1 Introduction

The following two-way fixed effects regression

$$y_{ijt} = \alpha_i + \lambda_t + \beta W_{it} + \varepsilon_{it}$$

and its dynamic ('event study') counterpart

$$y_{it} = \alpha_i + \lambda_t + \beta W_{it} + \sum_{s \neq -1}^{T} \gamma_s \Delta_{it}^s + \varepsilon_{it}$$

are extremely popular in applied econometrics.

2 Methodology

We propose using a joint F-test on the following specification

$$y_{it} = \alpha_i + \lambda_t + \beta W_{it} + \sum_{s \neq -1}^{T} \gamma_s \Delta_{it}^s + \sum_{s \neq -1}^{T} \delta_s W_{it} \Delta_{it}^s + \varepsilon_{it}$$

3 Simulation Studies

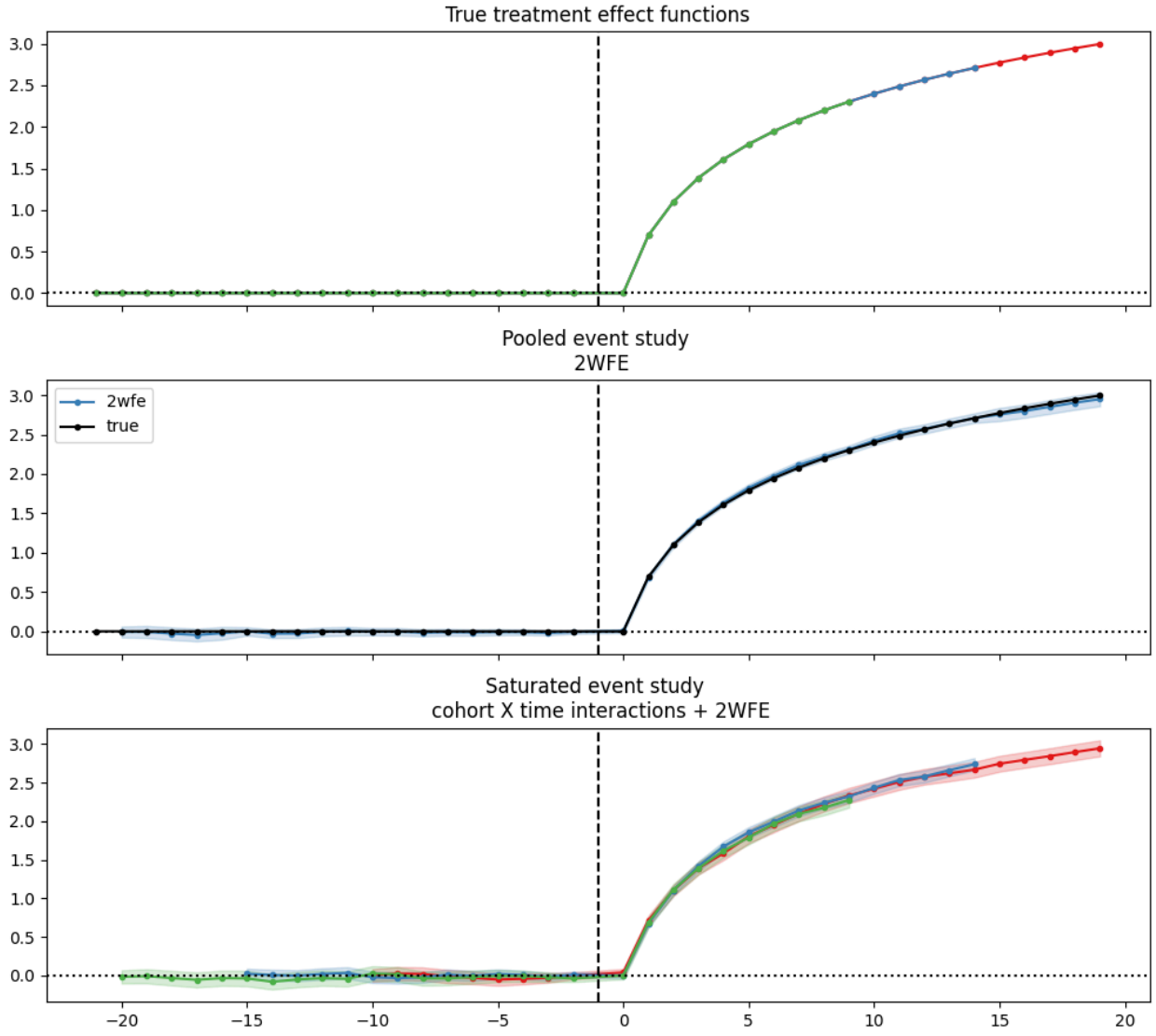

Figure 1: true and estimated effects from pooled and saturated event study regressions with homogeneous treatment effects across three cohorts

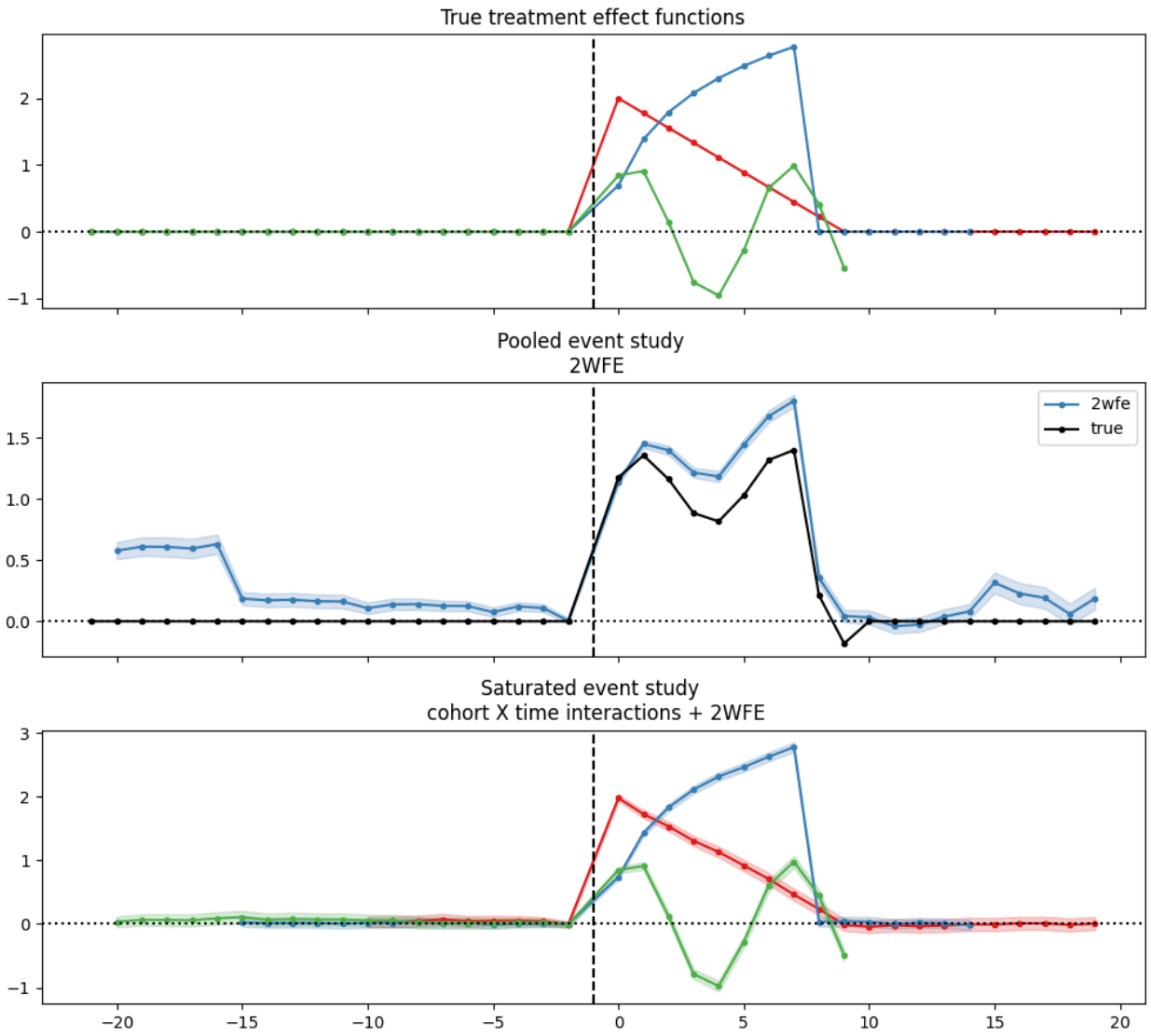

Figure 2: true and estimated effects from pooled and saturated event study regressions in a DGP with heterogeneous treatment effects across three cohorts

References