

diff - diff

v2.9

When Linear DiD

Isn't Enough.

Wooldridge (2023, 2025) ETWFE estimator

OLS, Logit, and Poisson QMLE in one class

Delta-method SEs, four aggregation types

The Nonlinear

Gap

Binary Outcomes

Voting, adoption, mortality -- bounded $[0, 1]$

Count Data

Patent filings, ER visits -- non-negative integers

Rates / Proportions

Employment rates, market shares -- fractional

Standard parallel trends may not hold on the level scale.

Wooldridge (2023): Simple approaches to nonlinear DiD

Wooldridge ETWFE

Extended Two-Way Fixed Effects

Wooldridge (2023, 2025) | Stata: jwddid

OLS specification (unit + time FE absorbed):

$$Y_{it} = \alpha_i + \gamma_t + \sum_g \sum_{t \geq g} \delta_{g,t} \cdot D_{ig} \cdot f_t + \mathbf{X}'\beta + \varepsilon_{it}$$

Logit / Poisson: cohort + time dummies, ASF for ATT

-- Single saturated regression

All ATT(g,t) estimated jointly

-- Heterogeneous treatment effects

Correctly handled across cohorts and time

-- Nonlinear link functions

OLS, Logit, or Poisson QMLE (the key insight)

Three Likelihoods

One Framework

OLS

Continuous outcomes

Wages, test scores, log-employment

Logit

Binary / fractional outcomes

Voting, adoption, participation rates

Poisson

Count / non-negative outcomes

Patents, ER visits, hiring

Choose the link function.

The estimator handles the rest.

Under the Hood

OLS: ATT(g,t) directly from coefficients

Logit / Poisson: ASF-based ATT

$$ATT(g, t) = \frac{1}{N_{g,t}} \sum_{i: G_i = g} [f(\hat{\eta}_{i,1}) - f(\hat{\eta}_{i,0})]$$

f = logistic | exponential

Delta-method SEs for all aggregations

simple

Overall weighted average ATT

group

ATT by treatment cohort

calendar

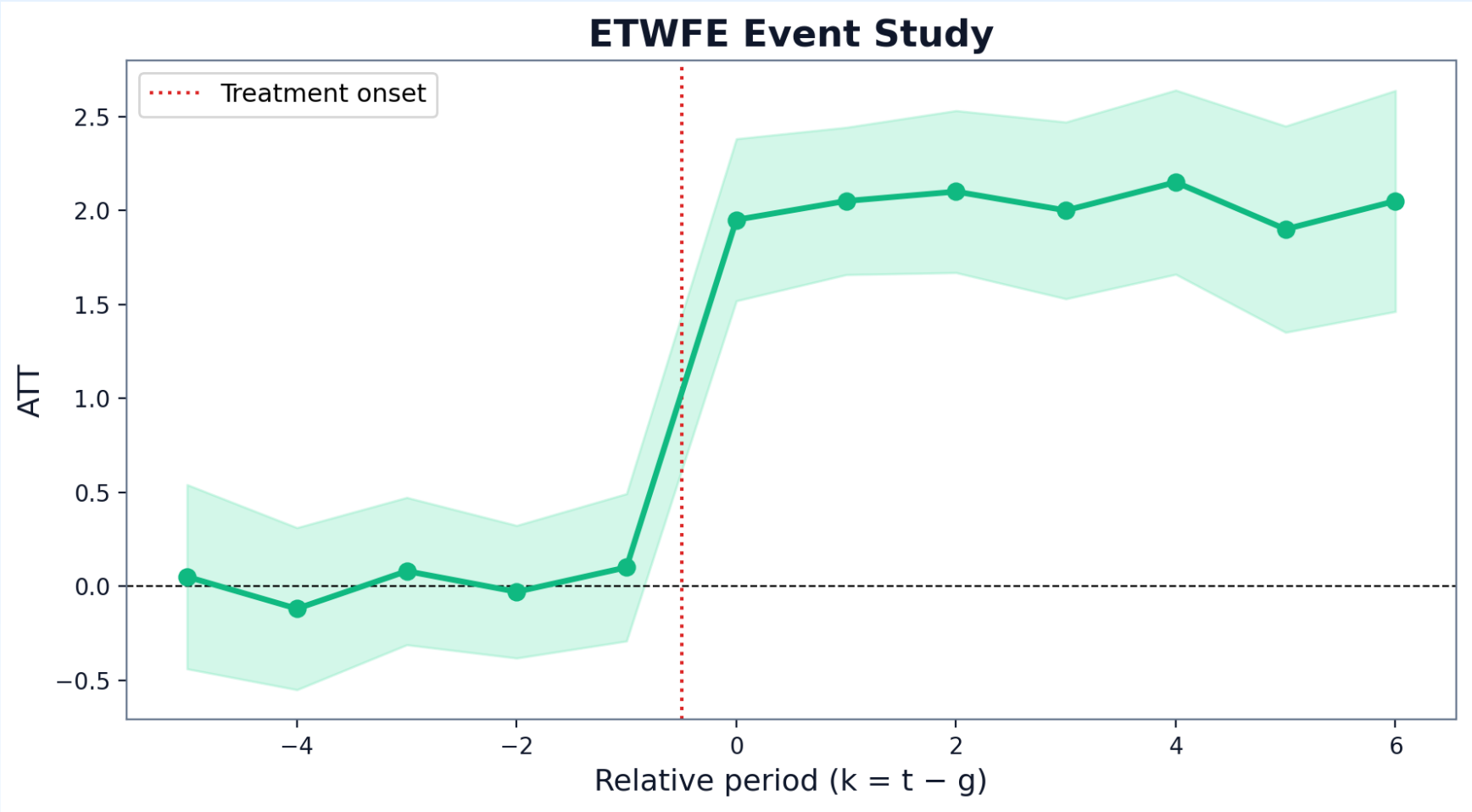
ATT by calendar period

event

ATT by relative time $k = t - g$

Matches Stata `jwdid_estat` output

Event Study



Pre-treatment: near zero (parallel trends hold)

Post-treatment: stable, significant effect

The Code

```
from diff_diff import WooldridgeDiD

est = WooldridgeDiD(method='poisson')

results = est.fit(

    data, outcome='emp',

    unit='county', time='year',

    cohort='first_treat')

results.aggregate('event').summary('event')
```

Same fit() API as every diff-diff estimator

OLS, Logit, or Poisson -- just change the method

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estimators and counting

The most comprehensive standalone

DiD library for Python

Community-contributed via PR #216

by @wenddymacro

Get Started

```
$ pip install --upgrade diff-diff
```

github.com/igerber/diff-diff

Tutorial 16: Wooldridge ETWFE

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Difference-in-Differences for Python