

diff - diff

When Treatment Isn't Permanent.

de Chaisemartin & D'Haultfoeuille (2024)

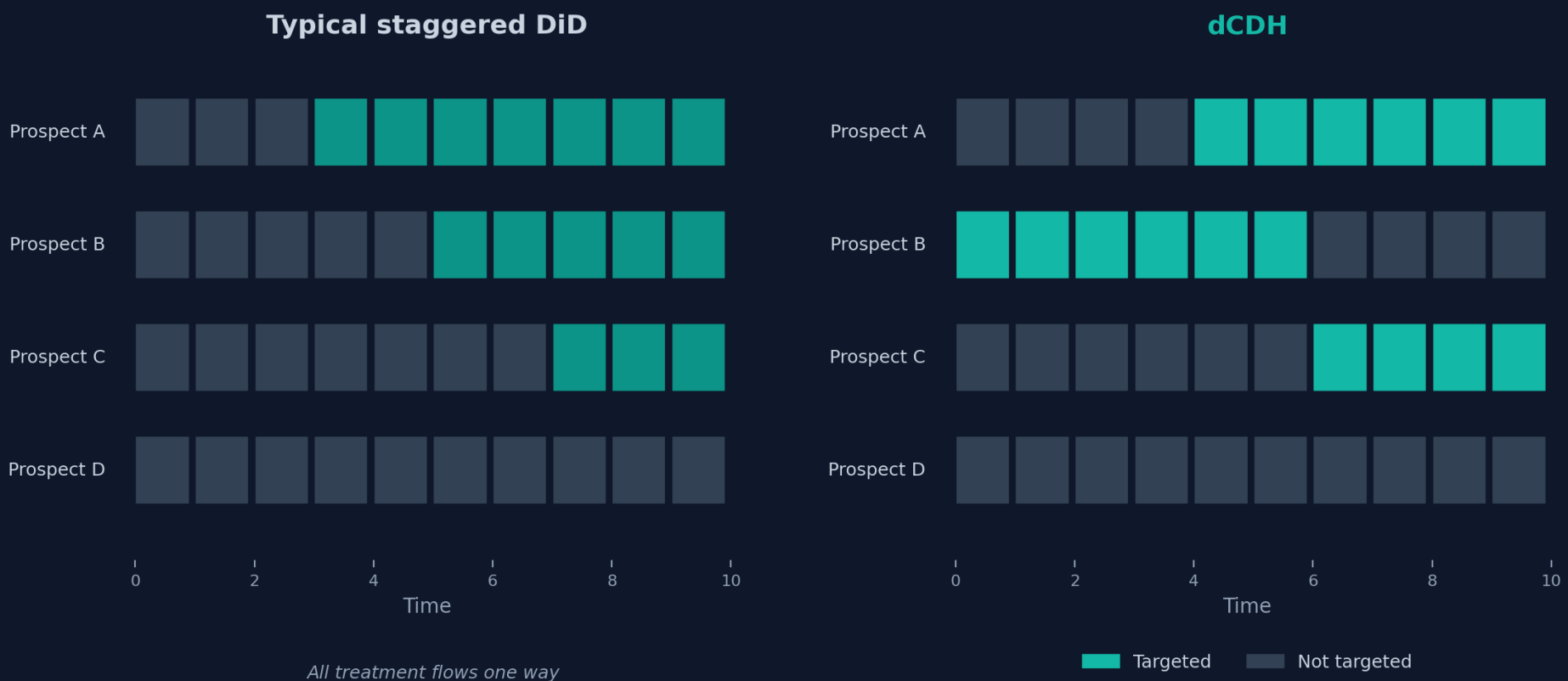
Joiners and leavers in one model

Dynamic event study with pre-trend placebos

The Permanent Treatment

Assumption

Most staggered DiD estimators assume absorbing treatment.



Some units adopt while others discontinue.

You need both directions.

Where Treatment Isn't Permanent

Marketing Campaigns

Target new prospects, untarget others - measure both

Policy Adoption & Repeal

States adopt policies while others repeal them

Clinical Treatments

Patients start a drug while others discontinue

Pricing & Promotions

Promotions launch in some stores, sunset in others

The dCDH Estimator

de Chaisemartin & D'Haultfoeuille (2020, 2024)

$$\text{DID}_M = \frac{1}{N_S} \sum_{t \geq 2} (N_{1,0,t} \cdot \text{DID}_{+,t} + N_{0,1,t} \cdot \text{DID}_{-,t})$$

Joiners (DID+)

Units switching ON

vs stable-untreated controls

Leavers (DID-)

Units switching OFF

vs stable-treated controls

Both directions estimated jointly,

weighted by the number of switchers in each period.

What Ships With It

Dynamic Event Study

Multi-horizon DID_l

for $l = 1..L_{max}$

Pre-Trend Placebos

DID^{pl}_l tests consistency

with parallel trends

Covariate Adjustment

DID^X residualization

for covariates

Group-Specific Trends

Linear and nonparametric

trend removal

Non-Binary Treatment

Ordinal or continuous

treatment magnitudes

HonestDiD Sensitivity

Rambachan-Roth bounds

on pre-trends

Sup-t Bands

Simultaneous inference

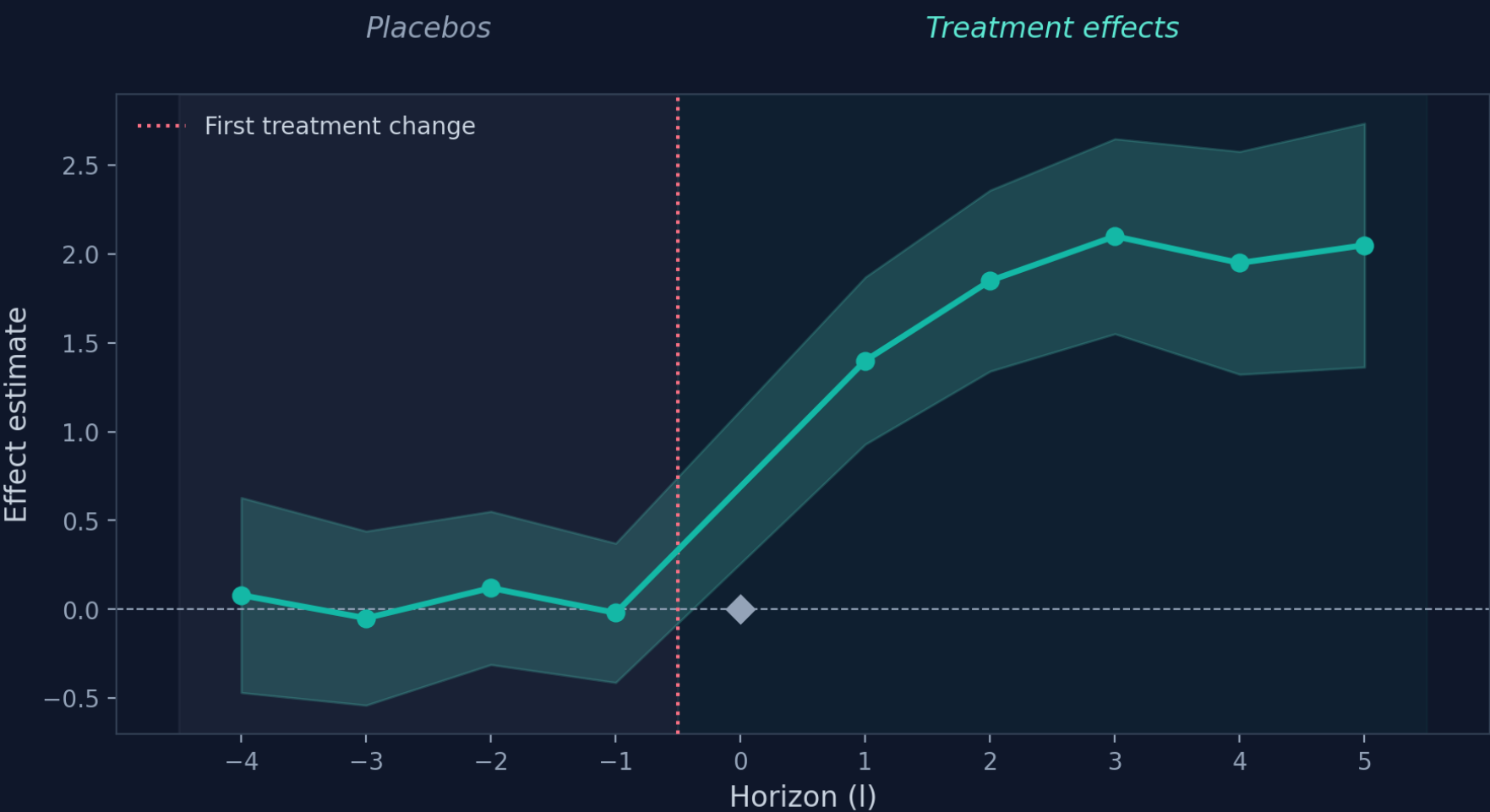
across all horizons

Multiplier Bootstrap

Rademacher, Mammen,

or Webb weights

Dynamic Event Study



Placebos near zero: consistent with parallel trends

Post-treatment: significant, persistent effects

The Code

Same sklearn-like API as every diff-diff estimator

```
from diff_diff import (
    ChaisemartinDHaultfoeuille as DCDH,
    plot_event_study
)

est = DCDH()

results = est.fit(
    data,
    outcome='conversions',
    group='prospect_id',
    time='week',
    treatment='targeted',
    L_max=3, placebo=True)

plot_event_study(results)
```

Placebos, event study, bootstrap - all from one fit() call.

Validated Against R

Point estimates match R's DIDmultiplegtDYN.

Point Estimate Parity

ATT validated against R reference outputs

SE Parity (pure-direction)

Analytical SEs match R on joiners-only and leavers-only

HonestDiD Integration

Rambachan-Roth sensitivity on the placebo surface

Multiplier Bootstrap

Rademacher, Mammen, and Webb weight distributions

Get Started

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

github.com/igerber/diff-diff

diff - diff

Difference-in-Differences for Python