undid: a Stata package for difference-in-differences with unpoolable data

Package developed by Eric Jamieson

Based on the paper *Difference-in-Differences with Unpoolable Data* by Karim, Webb, Austin, & Strumpf (2025)

#1 Motivation

Existing difference-in-differences (DiD) models implicitly assume that data is poolable. However, there are many research questions that necessitate working with private or confidential data which is not allowed to be exported outside of its respective silo.

Examples of data which is often unpoolable include:

- health care data from different insurers, provinces, or countries
- restricted use micro-data in secure research environments

#2 Methodology Overview

For the simple computation of the average treatment effect on the treated (ATT) with two periods and two silos, note that it is possible to compute each difference locally at each silo:

$$ATT = \underbrace{\left(\overline{Y}_{T,1} - \overline{Y}_{T,0}\right)}_{\lambda_{Treated,1-0}} - \underbrace{\left(\overline{Y}_{C,1} - \overline{Y}_{C,0}\right)}_{\lambda_{Control,1-0}}$$

To allow for covariates and staggered adoption, $\lambda_{silo,post-pre}$ is calculated by the regression:

$$Y_{i,t} = \alpha + \lambda D_t + x_i'\beta$$

where $t \in \{t_0, t_1\}$, with t_0 being the before treatment period and t_1 the relevant post−treatment period.

D_t is equal to 1 if the observation is post treatment time, and 0 otherwise, and $x_i'\beta$ are the vectors of covariate values and coefficients, respectively, for observation i. For staggered adoption, every relevant value of λ is calculated such that each post-treatment period is compared to the pre-treatment period.

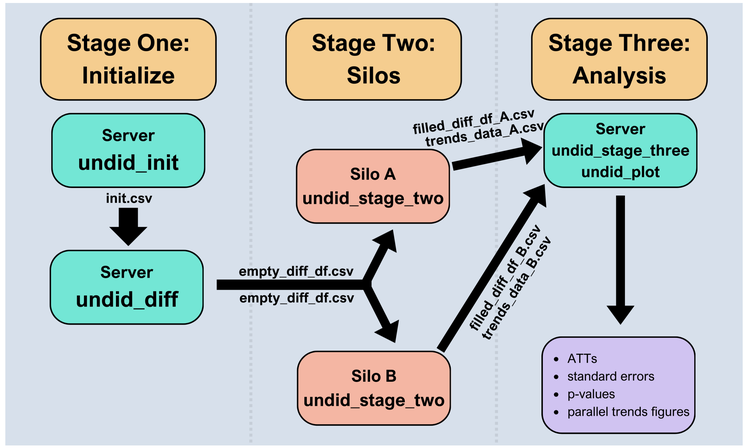
The sub-aggregate ATTs are then computed via a regression such as the following, where *treat* is a binary variable indicating if the λ value comes from a treated silo:

$$\lambda_{silo,g,t} = \alpha + \text{ATT}treat_{silo,g,t} \text{ if } G = g \text{ and } T = t$$

where G is the treatment time, and T is the specified post−treatment period

Finally, the aggregate ATT is computed as a weighted mean of the $ATT_{g,t}$ terms.

#3 undid Framework



undid implements the UN-DID methodology introduced by Karim et al. (2025) in three stages.

Stage One: Initialize

- **undid_init:** Researchers specify the start and end dates for the analysis, the silos, the treatment times, and any covariates. Creates a CSV file.
- **undid_diff:** The CSV file created by **undid_init** is transformed into a larger CSV file with embedded instructions telling each silo the time periods for which λ values must be calculated, and what covariates, if any, should be included.

Stage Two: Silos

- **undid_stage_two:** With the local silo's data loaded, users call this command to produce two CSV files: one with the λ values; and the other with the mean of the outcome variable (and its residualized analog, if covariates were specified) by period.

Stage Three: Analysis

- **undid_stage_three:** Researchers specify a path to the folder containing all the CSV files with the computed λ values from every silo. Sub-aggregate ATTs, the aggregate ATTs and all related standard errors and p-values are returned.
- **undid_plot:** Given a path to the folder with the trends data CSV files, produces parallel trends and event study plots.

#4 Outputs

undid_stage_three, dir_path("filepath")

```
. undid_stage_three, dir_path("test_csv_files\stage_three\staggered")
------------------------------------------------------------------------------
                        undid: Sub-Aggregate Results
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Sub-Aggregate Group | ATT        | SE    | p-val | JKNIFE SE | JKNIFE p-val | RI p-val |
--------------------|------------|-------|-------|-----------|--------------|----------|
1991                |0.0529100   | 0.022 | 0.017 | 0.024     | 0.030        |0.524     |
1993                | 0.0235928  | 0.017 | 0.155 | 0.019     | 0.204        | 0.685    |
1996                |0.0564351   | 0.024 | 0.021 | 0.029     | 0.057        |0.504     |
1997                |0.0711167   | 0.023 | 0.002 | 0.027     | 0.009        |0.208     |
1998                |0.0485436   | 0.033 | 0.143 | 0.039     | 0.213        |0.485     |
1999                |0.0120440   | 0.015 | 0.424 | 0.021     | 0.561        |0.867     |
2000                |-0.0330623  | 0.032 | 0.308 | 0.096     | 0.732        |0.687     |
--------------------|------------|-------|-------|-----------|--------------|----------|

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   undid: Aggregate Results
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Aggregation: g
Weighting: both
Aggregate ATT: .04582252
Standard error: .01159691
p-value: .00752668
Jackknife SE: .01329357
Jackknife p-value: .01368368
RI p-value: .146
Permutations: 1000
```

undid_plot, dir_path("filepath") plot("event") ci(0.90) event_window(-7 7)

undid_plot, dir_path("filepath")

Contact Information

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Reference:
R package (available on CRAN):
Julia package:

undid is available on SSC via ssc install undid

See more documentation for **undid**: