Code for: Debiasing and T-Tests for Synthetic Control Inference on Average Causal Effects*

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The code in this replication package replicates all the empirical and simulation results in the main text and appendices of "Debiasing and T-Tests for Synthetic Control Inference on Average Causal Effects," by Victor Chernozhukov, Kaspar Wüthrich, and Yinchu Zhu, accepted at the Journal of Political Economy.

Data

This paper uses one external dataset, `carbontax_data.dta`, from the replication package of Andersson (2019a) (Andersson, 2019b). The replication package and the dataset can be downloaded from the OPENICPSR website: https://doi.org/10.3886/E231579V1. Downloading the dataset requires logging in on the OPENICPSR website. The dataset is licensed under the CC BY 4.0 license (https://creativecommons.org/licenses/by/4.0/).[1] A copy of the full original license in Andersson (2019b) is also included in the replication package (`LICENSE_Andersson2019.txt`).

Computational and software requirements

All the code was written in `R` (R Core Team, 2025b). The code was last run with `R` version 4.5.2 (Platform: aarch64-apple-darwin20) on a 2025 Mac Studio (Apple M3 Ultra, 96 GB Memory, Tahoe 26.2). The total runtime on this setup was less than five hours.

Random seeds are set in each script relying on pseudorandom number generators.

The following external packages were used. The most recent version of all these packages can be installed by running `code/0_setup.R`.

*Parts of this README file are based on and inspired by the template provided by the Social Science Data Editors.

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- `devtools` (2.4.5) (Wickham et al., 2022)
- `remotes` (2.5.0) (Csardi et al., 2024)
- `synthdid` (0.0.9, from `https://github.com/synth-inference/synthdid`, can be installed via `devtools::install_github("synth-inference/synthdid@70c1ce3")`) (Hirshberg, 2023)
- `scinference` (0.0.0.9000, from `https://github.com/kwuthrich/scinference`, can be installed via `remotes::install_github("kwuthrich/scinference@v1.0.0")`) (R-package implementing the proposed method, written by the authors)
- `limSolve` (2.0.1) (Soetaert et al., 2009)
- `xtable` (1.8-4) (Dahl et al., 2019)
- `foreign` (0.8-90) (R Core Team, 2025a)
- `pracma` (2.4.4) (Borchers, 2023)
- `sandwich` (3.1-1) (Zeileis, 2004; Zeileis et al., 2020)
- `writexl` (1.5.4) (Ooms, 2025)

Description of scripts

All the scripts are in the folder `code`. This folder contains two main scripts and a subfolder with auxiliary scripts.

- `code/0_setup.R`: This script installs the most recent versions of all the required packages.
- `code/1_main.R`: This script replicates all the results by running the scripts in the folder `code/auxiliary scripts`.
- `code/auxiliary scripts/intro_bias.R`: This script replicates the illustration of the impact of bias correction. It outputs **Figure 1**.
- `code/auxiliary scripts/intro_nw.R`: This script replicates the illustration of the under-coverage with Newey-West standard errors. It outputs **Figure 2**.
- `code/auxiliary scripts/tradeoff.R`: This script replicates the illustration of the trade-off between coverage accuracy and length when choosing K. It outputs **Figure 3**.
- `code/auxiliary scripts/RAE.R`: This script computes the RAE for different K. It outputs **Table 1**.
- `code/auxiliary scripts/sim_sweden_small.R`: This script replicates the simulation study based on the empirical application. It also replicates the simulations illustrating the impact of small T_1. It outputs **Table 3** and **Figures 5–6**.
- `code/auxiliary scripts/app_sweden.R`: This script replicates the empirical results based on the reanalysis of Andersson (2019a). It outputs **Figure 4** and **Tables 4–5**.

- `code/auxiliary scripts/sim_sweden_large.R`: This script replicates the simulation study based on the empirical application with large T_0. It outputs **Table 6**.
- `code/auxiliary scripts/comparison_permutation.R`: This script replicates the simulation comparison between the t-test and the permutation approach. It outputs **Figure 7**.
- `code/auxiliary scripts/time_varying_weights.R`: This script replicates the simulation illustration of the impact of time-varying weights. It outputs **Figure 8**.
- `code/auxiliary scripts/common_functions.R`: Auxiliary script that contains common functions used by the other scripts.
- `code/auxiliary scripts/calibration_dgps.R`: Auxiliary script that calibrates Monte Carlo DGPs based on the empirical application in Andersson (2019a).

Folders

- `code`: This folder contains the code to replicate all the results.
  - `auxiliary scripts`: This folder contains the scripts that are run by the main driver script `code/1_main.R`.
- `data`: Folder for the external dataset.
- `graphics`: Figures will be saved in this folder.
- `tables`: Tables will be saved in this folder.

Step-by-step instructions for replicators

All the results can be replicated using the following steps.

1. Download the dataset `carbontax_data.dta` from the replication package Andersson (2019b) (`https://doi.org/10.3886/E231579V1`) and save it in the folder `data`.
2. Run `code/0_setup.R` to install all the required packages.
3. Change the working directory in `code/1_main.R`.
4. Run `code/1_main.R` to replicate all the results. The figures will be stored in the folder `graphics`. The tables in LaTeX format are printed line-by-line into the `R` console. The content of the tables is also stored in .xlsx format in the folder `tables`.

Statement about rights

I certify that the authors of the manuscript have legitimate access to and permission to use the data used in this manuscript.

I certify that the authors of the manuscript have documented permission to redistribute/publish the data contained within this replication package. Appropriate permission are documented in the `LICENSE_Andersson2019.txt` file.

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