## <u>Title</u>

scplotmulti — Synthetic Control Methods with Multiple Treated Units Plots.

## **Syntax**

```
scplot , [scest uncertainty(string) uncertainty(string) joint yscalefree xscalefree
   dots_tr_col(colorstyle) dots_tr_symb(symbolstyle) dots_tr_size(markersizestyle)
   dots_sc_col(colorstyle) dots_sc_symb(symbolstyle) dots_sc_size(markersizestyle)
   line_tr_col(colorstyle) line_tr_patt(linepatternstyle)
   line_tr_width(linewidthstyle) line_sc_col(colorstyle)
   line_sc_patt(linepatternstyle) line_sc_width(linewidthstyle)
   spike_sc_col(colorstyle) spike_sc_patt(linepatternstyle)
   spike_sc_width(linewidthstyle) gphoptions(string) gphcombineoptions(graph combine)
   gphsave(string) savedata(dta name) keepsingleplots pypinocheck]
```

# **Description**

scplot implements several Synthetic Control (SC) plots even in the presence of
 multiple treated units and staggered adoption. The command is designed te be
 called after scest or scpi which implement estimation and inference procedures for
 SC methods using least squares, lasso, ridge, or simplex-type constraints
 according to Cattaneo, Feng, and Titiunik (2021). The command is a wrapper of the
 companion Python package. As such, the user needs to have a running version of
 Python with the package installed. A tutorial on how to install Python and link it
 to Stata can be found here.

Companion  $\underline{R}$  and  $\underline{Python}$  packages are described in  $\underline{Cattaneo}$ ,  $\underline{Feng}$ ,  $\underline{Palomba}$  and  $\underline{Titiunik}$  (2022).

Companion commands are:  $\underline{scdata}$  for data preparation,  $\underline{scest}$  for estimation procedures, and  $\underline{scpi}$  for inference procedures.

Related Stata, R, and Python packages useful for inference in SC designs are described in the following website:

https://nppackages.github.io/scpi/

For an introduction to synthetic control methods, see <u>Abadie (2021)</u> and references therein.

### Options



scest if specified scplot must be called after scest. Otherwise, it is presumed that
 scplot is called after scpi.

uncertainty(string) specifies which prediction intervals are plotted. It does not



affect the plot if scest is specified. Options are:
 insample prediction intervals quantify only in-sample uncertainty.
 gaussian prediction intervals quantify in-sample and out-of-sample uncertainty
 using conditional subgaussian bounds.

ls prediction intervals quantify in-sample and out-of-sample uncertainty imposing
 a location-scale model.

qreg prediction intervals quantify in-sample and out-of-sample uncertainty using
 quantile regressions.

ptype(string) specifies the type of plot to be produced. If set to 'treatment', then
 treatment effects are plotted. If set to 'series' (default), the actual and
 synthetic time series are reported.

joint if specified simultaneous prediction intervals are included in the plot(s).

Scale Options

yscalefree if specified each graph has its own scale for the y axis.
 xscalefree if specified each graph has its own scale for the x axis.

These options let the user specify color, size, and form of the markers in the plot.

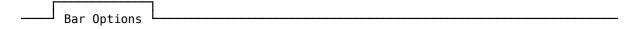
Marker Options

dots\_tr\_col(colorstyle) specifies the color of the markers for the treated unit.
dots\_tr\_symb(symbolstyle) specifies the form of the markers for the treated unit.
dots\_tr\_size(markersizestyle) specifies the size of the markers for the treated unit.
dots\_sc\_col(colorstyle) specifies the color of the markers for the SC unit.
dots\_sc\_symb(symbolstyle) specifies the form of the markers for the SC unit.
dots\_sc\_size(markersizestyle) specifies the size of the markers for the SC unit.



These options let the user specify color, pattern, and width of the lines in the plot.

line\_tr\_col(colorstyle) specifies the color of the line for the treated unit.
line\_tr\_patt(linepatternstyle) specifies the pattern of the line for the treated unit.
line\_tr\_width(linewidthstyle) specifies the width of the line for the treated unit.
line\_sc\_col(colorstyle) specifies the color of the line for the SC unit.
line\_sc\_patt(linepatternstyle) specifies the pattern of the line for the SC unit.
line\_sc\_width(linewidthstyle) specifies the width of the line for the SC unit.



These options let the user specify color, pattern, and width of the bar (spikes) in the plot. These options do not have effect if **scest** is specified.



spike\_sc\_col(colorstyle) specifies the color of the bars for the SC unit.
spike\_sc\_patt(linepatternstyle) specifies the pattern of the bars for the SC unit.
spike\_sc\_width(linewidthstyle) specifies the width of the bars for the SC unit.

Others

gphoptions(string) specifies additional options to modify individual plots.
gphcombineoptions(graph combine) specifies additional options to modify the final
 combined plot.

gphsave(string) specifies the path and the name of the .gph file that is saved by the command.

savedata(dta\_name) saves a dta\_name.dta file containing the processed data used to produce the plot.

**keepsingleplots**) if specified saves the individual plots in .gph format in the current directory.

pypinocheck) if specified avoids to check that the version of scpi\_pkg in Python is
 the one required by scplot in Stata. When not specified performs the check and
 stores a macro called to avoid checking it multiple times.{p\_end

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### **Example: Germany Data**

Setup

. use scpi\_germany.dta

Prepare data

. scdata gdp, dfname("python\_scdata") id(country) outcome(gdp) time(year)
treatment(status) cointegrated

Estimate Synthetic Control with a simplex constraint and quantify uncertainty . scpi, dfname("python\_scdata") name(simplex) u\_missp

Plot Synthetic Control Estimate with Prediction Intervals
 . scplot, gphsave("plot\_scpi")

### References

- Abadie, A. 2021. <u>Using synthetic controls: Feasibility, data requirements, and methodological aspects.</u> *Journal of Economic Literature*, 59(2), 391–425.
- Cattaneo, M. D., Feng, Y., and Titiunik, R. 2021. <u>Prediction Intervals for Synthetic Sontrol Methods</u>. *Journal of the American Statistical Association*, 116(536), 1865–1880.
- Cattaneo, M. D., Feng, Y., Palomba F., and Titiunik, R. 2022. <u>scpi: Uncertainty</u> <u>Quantification for Synthetic Control Estimators</u>, *arXiv*:2202.05984.
- Cattaneo, M. D., Feng, Y., Palomba F., and Titiunik, R. 2022. Uncertainty



<u>Quantification in Synthetic Controls with Staggered Treatment Adoption</u>, *arXiv*:2210.05026.

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