Regression II
Vanderbilt University
Prof. Sean P. Corcoran

Problem Set 5 *Solutions*
50 total points

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This problem will replicate the analysis reported in Bifulco, Rubenstein, and Sohn (2017).[1] That study used a synthetic control design to estimate the impact of Say Yes to Education (a promise scholarship program in Syracuse, New York, which provided free college tuition to any student who graduated from a public high school in Syracuse) on total district enrollment and graduation rates. The program was implemented in 2008.

There are two datasets on Github containing panels of enrollment and graduation data, respectively, that can be opened in Stata using:

```
use https://github.com/spcorcor18/LPO-8852/raw/main/data/nys_data_enroll.dta, clear
use https://github.com/spcorcor18/LPO-8852/raw/main/data/nys_data_grad.dta, clear
```

Most of the variables in these datasets should be self-explanatory from their variable names and labels (although I'm not sure what *target_donor* and *small_index* refer to, as they don't appear to align with the paper's selection of potential donor districts).

The authors used two potential donor pools. The comprehensive donor pool included all 275 (non-Syracuse) districts, while the restricted donor pool included 22 districts categorized as "City–Large," "City–Midsize," or "City–Small." (Note these counts are a little smaller for the graduation rate panel). NYC is excluded from the dataset.

Using the synthetic control packages in Stata (`synth`, `synth_wrapper`, and `synth2`), replicate the findings in this paper by reporting the elements listed below. Note you do not need to run all 6 alternative specifications of the pretreatment years (Table 1). Rather, just use their Specification (2)—the first, middle, and last year of pretreatment periods—and Specification (4)—the last pretreatment year and the average of outcomes in all other pretreatment years. They included the percent eligible for free or reduced price lunch, the percent Black, and the percent Hispanic in every specification.

Taken together, you will have eight sets of results: two outcomes (enrollment and graduation rates) $\times$ two specifications (2 and 4) $\times$ two potential donor pools. Brownie points to those who combine these results in a pleasing-to-read format.

Include these things in your results, and be sure to submit your do-file:

[1] Thank you to Bob Bifulco and Hosung Song for providing the data used in their paper.

(a) The weights assigned to donor districts, as in Tables 2 and 5. Write a few sentences summarizing the resulting weighting used. Do they correspond to the weights reported in the paper? **(10 points)**

(b) The main synthetic control graph showing trends in Syracuse and its synthetic control, as in Figures 2 and 3. Briefly summarize what you see. **(10 points)**

(c) The "gap" version of the graphs in (b) showing the *gap* in mean outcomes between Syracuse and its synthetic control (these were not shown in the paper). **(5 points)**

(d) Point estimates of the treatment effect by year (2008, 2009, 2010, and 2011), as in Tables 3 and 6. Note the graduation rate data only include 3 post-treatment years. **(5 points)**

(e) The graph showing the gap in mean outcomes between Syracuse and its synthetic control, and the placebo gaps. Only use the restricted donor pool here, to keep the number of placebo districts manageable. Briefly summarize what you see. **(10 points)**

(f) p-values from the placebo-based inference. Explain in words where these come from, and how they should be interpreted. (Note, you only need to do the latter for one set of results, not every specification and outcome). **(10 points)**

(g) If you have access to Stata 16+ and can use `synth2`, do a "leave-one-out" (loo) robustness test for one of the enrollment outcome specifications, using the restricted donor pool. Interpret the results. **(5 points bonus)**

Note if you have Stata 16+ and can use `synth2` you may find it easier to obtain all of the above items. If not, the other commands can be used. See the in-class exercise do-file for help, and it would (of course) help to refer to the original Bifulco et al paper.

MY SOLUTIONS:

General comments about the replication and synth commands:

- See the attached log file for all syntax and results (other than figures).
- My original instructions said to use small, midsize, and large cities for the restricted donor pool. It was brought to my attention that the results replicate better when using the provided *target_donor* flag for the restricted pool. This flag is not consistent with how the paper describes the restricted donor pool, but I decided to go with it. All results shown here for the restricted pool use *target_donor*. (They say their restricted pool includes districts described as "small cities" by the NYS Association of Small City Districts, but according to their website, there are 57 of those).
- The `synth` commands seem to be sensitive to the use of variable labels. I tried to use the provided district names as labels, but kept running into error messages. Concerned that the district name could be too long, I created a new version that truncated it to 12 characters. This seems to have worked. Having labels on your numeric id is very useful for seeing which units received positive weights.

Weights (part a):

- Enrollment: the weights for each specification are shown in Table 1 below. For both the full and restricted donor pools, the selected cities and weights are very similar to those in the paper's Table 2. (Specification 4 in particular is very close). Rochester and Niagara Falls consistently receive a lot of weight in the synthetic control.
- Graduation: the weights for each specification are shown in Table 1 below. For both the full and restricted donor pools, the selected cities and weights are very similar to those in the paper's Table 2. (The full donor pool is especially close). Buffalo receives the most weight in all cases.
- Note I used the `synth` option `keep(`*`filename.dta`*`) replace` to save the predicted outcomes and weights each time. Later in my do-file, I aggregated these into four datasets containing predicted outcomes (all specifications, separate enrollment and graduation) and weights (all specifications, separate enrollment and graduation).

Main graphs (parts b-c):

- Figures 1 (enrollment) and 4 (graduation) below show the time path for Syracuse and its synthetic control. These look very similar to those in the paper.
- Figures 2 (enrollment) and 5 (graduation) below show the estimated treatment effect in each year (i.e., the gap between Syracuse and its synthetic control).

Treatment effects (part d):

- Note I aggregated the predicted outcomes as described above and then copied these over to Excel, where I created my own table (Table 1).

- Enrollment: the estimated treatment effects by year (2008-2011) are quite close to those in the paper's Table 3. Small differences are due to small differences in selected weights. Taking an average over the four post-treatment years, the enrollment effect appears to be about 530-730 students.

- Graduation: the estimated treatment effects by year (2008-2010) are quite close to those in the paper's Table 6. Small differences are due to small differences in selected weights. All point estimates are *negative*, which is unexpected. However, the authors determined that the synthetic control for graduation was less reliable, due to the noise in this measure.

Placebo graphs (part e):

- Figures 3 (enrollment) and 6 (graduation) below show the estimated treatment effect in year for Syracuse (the bold line). The gray lines represent placebo effects: they are the result of running the `synth` command for every other district as if it were the treated district. (Syracuse is removed from the donor pool for these placebo cases). In these graphs, compare Syracuse to the other placebo districts in the post-treatment period. Are its treatment effects larger than most of the others? If so, its effect are unlikely to have arisen by chance. (The placebo districts give you a look at what the estimates would be in the absence of any effect).

- These graphs are difficult to read in the full donor pool case, given the large number of donors. These graphs could be cleaned up further by omitting placebo cases where the pre-treatment fit was bad—i.e., you would select a RMSPE threshold in the pre-treatment period above which a placebo district would not be shown on the graph. It is hard to judge visually, but Syracuse does look like an outlier in the enrollment Figure 3. The graduation result (Figure 6) is less conclusive.

***p*-values (part f):**

- p-values for each treatment effect estimate are reported in Table 2 below. These are based on placebo inference: the represent the proportion of placebo districts that have a larger treatment effect estimate in that year. A small p-value suggests that the observed treatment effect was unlikely to have arisen by chance. Most of the p-values in Table 2 are above usual significance levels, although many point estimates for enrollment are significant.

- The *standardized* p-values reflect an adjustment for the quality of the pre-treatment period fit (see the Galiani & Quistorff (2018) article that accompanied `synth_runner`). It is surprising that these would be larger than the usual p-values.

- Note the paper reported RMPSE and an "overall" p-value based on the ratio of the post-to-pre RMPSE. This is reported among the saved results as a scalar e(pval_joint_post_std). You can also calculate these yourself using the saved data in `synth_runner`, which contains the RMPSEs.

Leave one out tests (part g):

- The `synth2` command makes much of the above work easier. My do-file showing the syntax with `synth2` is uploaded to Github. Note this requires Stata 16 or higher.

- I was able to access Stata 16 using Vanderbilt's cloud environment. The leave-on-one robustness tests for enrollment are shown in Figures 7-8. The gray lines are a bit faint but they represent iterated synthetic controls where one of the original districts with a positive weight is omitted from the pool. The aim here is to see how sensitive the findings are to the exclusion of one district. On balance, the results look quite similar to the original. At the very least, they are not consistent with a zero treatment effect.

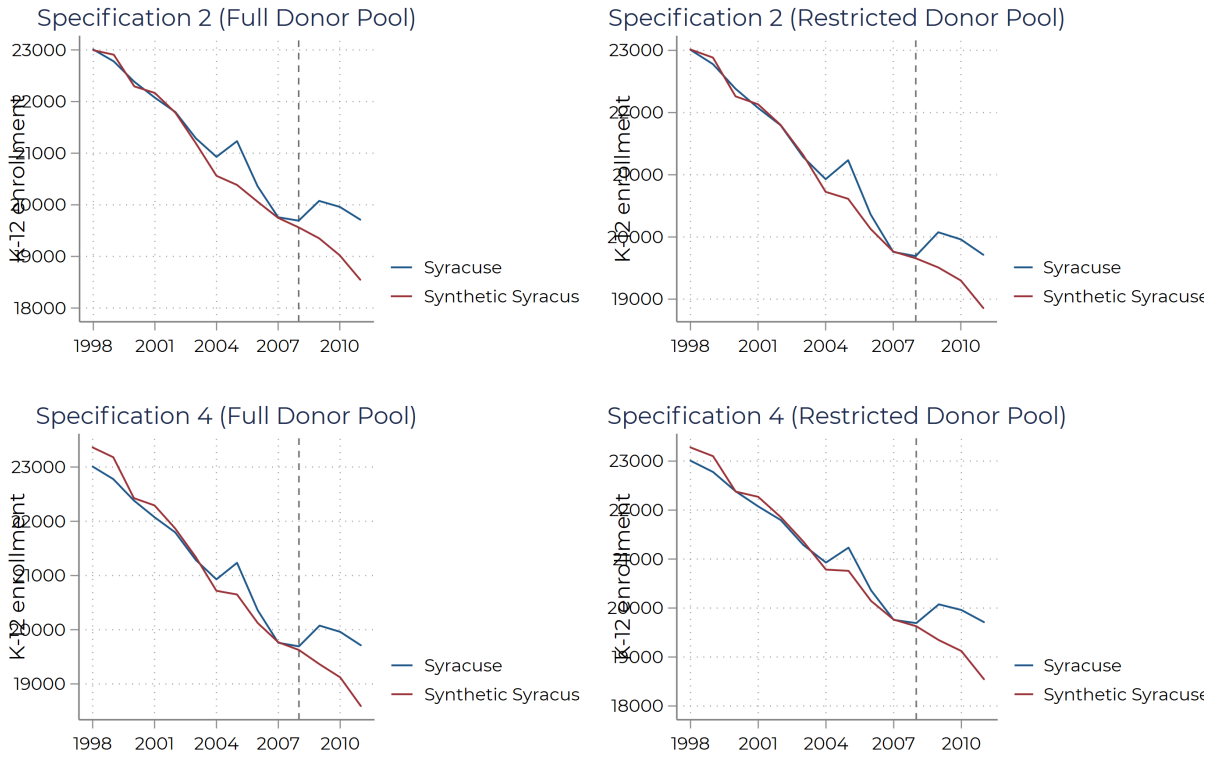
Table 1: Treatment effect estimates and weights

	K-12 enrollment				Graduation rates			
Specification:	2	2	4	4	2	2	4	4
Pool:	Full	Restricted	Full	Restricted	Full	Restricted	Full	Restricted
Point estimates:								
2008	130.7	35.5	66.9	63.5	-13.3	-9.4	-8.9	-5.8
2009	725.2	566.0	712.9	730.3	-6.3	-1.6	-2.0	-1.2
2010	938.8	660.7	839.6	838.5	0.4	-2.8	-1.9	-1.9
2011	1164.1	855.9	1120.7	1165.4				
Average	739.7	529.5	685.0	699.5	-6.4	-4.6	-4.3	-3.0
Weights:								
Albany	-	0.048	-	-	-	-	0.005	-
Buffalo	0.167	0.088	0.065	0.034	0.477	0.789	0.683	0.565
Elmira	-	-	0.148	-	-	-	0.193	-
Greenburgh 11	-	-	-	-	0.166	-	0.072	-
Hempstead	-	-	-	-	-	0.036	-	-
Hopevale UFD	0.239	-	0.021	-	-	-	-	-
Hudson	-	-	-	-	-	-	-	0.016
Mt Vernon	0.051	-	-	-	-	-	-	-
Niagara Falls	-	0.240	0.324	0.499	0.168	0.090	-	-
Poughkeepsie	-	-	-	-	-	-	0.047	-
Rensselaer	-	-	-	-	0.189	-	-	-
Rochester	0.363	0.392	0.442	0.467	-	-	-	0.174
Schenectady	-	-	-	-	-	0.085	-	0.245
Smithtown	0.179				-	-	-	-
Utica		0.233			-	-	-	-
Total	0.999	1.001	1.000	1.000	1.000	1.000	1.000	1.000

Table 2: p-values

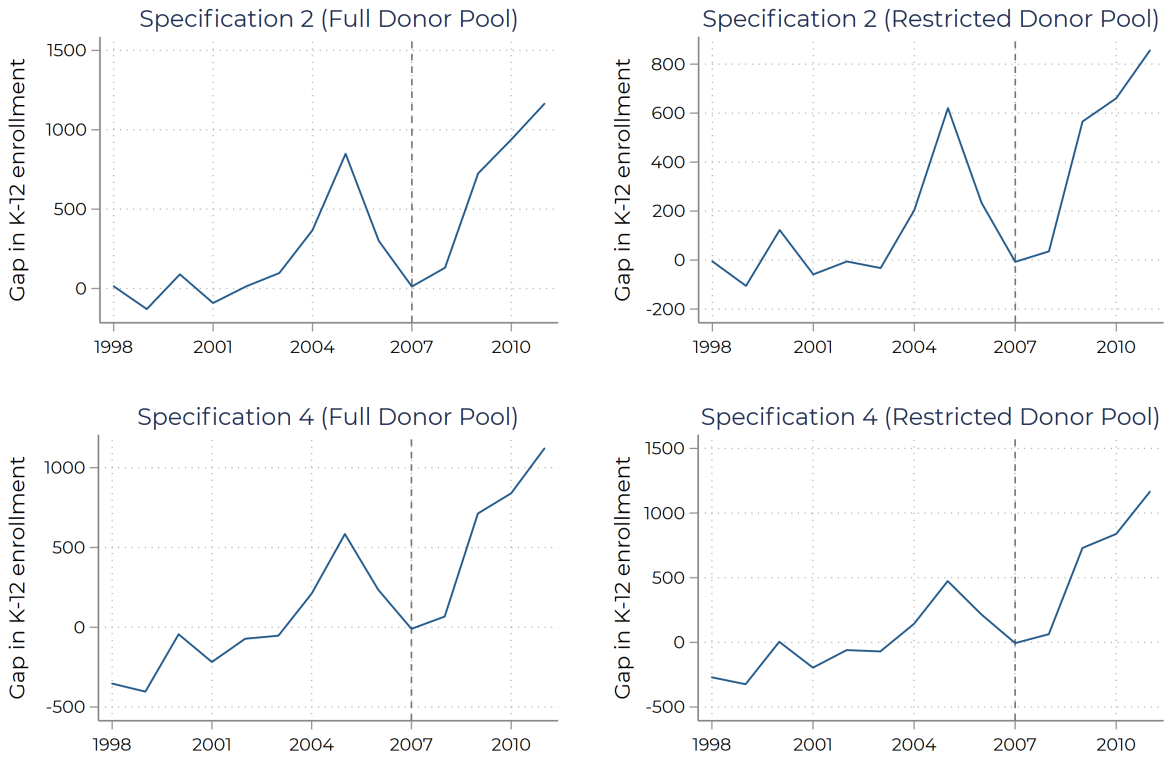
	K-12 enrollment				Graduation rates			
Specification	2	2	4	4	2	2	4	4
Pool	Full	Restricted	Full	Restricted	Full	Restricted	Full	Restricted
p-values:								
2008	0.189	1	0.516	0.727	0.013	0.182	0.059	0.318
2009	0.007	0.227	0.007	0.091	0.089	0.955	0.508	0.864
2010	0.004	0.182	0.011	0.091	0.903	0.681	0.593	0.773
2011	0.011	0.182	0.011	0.091				
p-values (std):								
2008	0.785	0.955	0.833	0.818	0.025	0	0.038	0.091
2009	0.353	0.273	0.24	0.136	0.153	0.818	0.521	0.636
2010	0.313	0.318	0.233	0.136	0.936	0.5	0.61	0.591
2011	0.32	0.182	0.211	0.145				

Figure 1: Mean enrollment, Syracuse school district and synthetic control



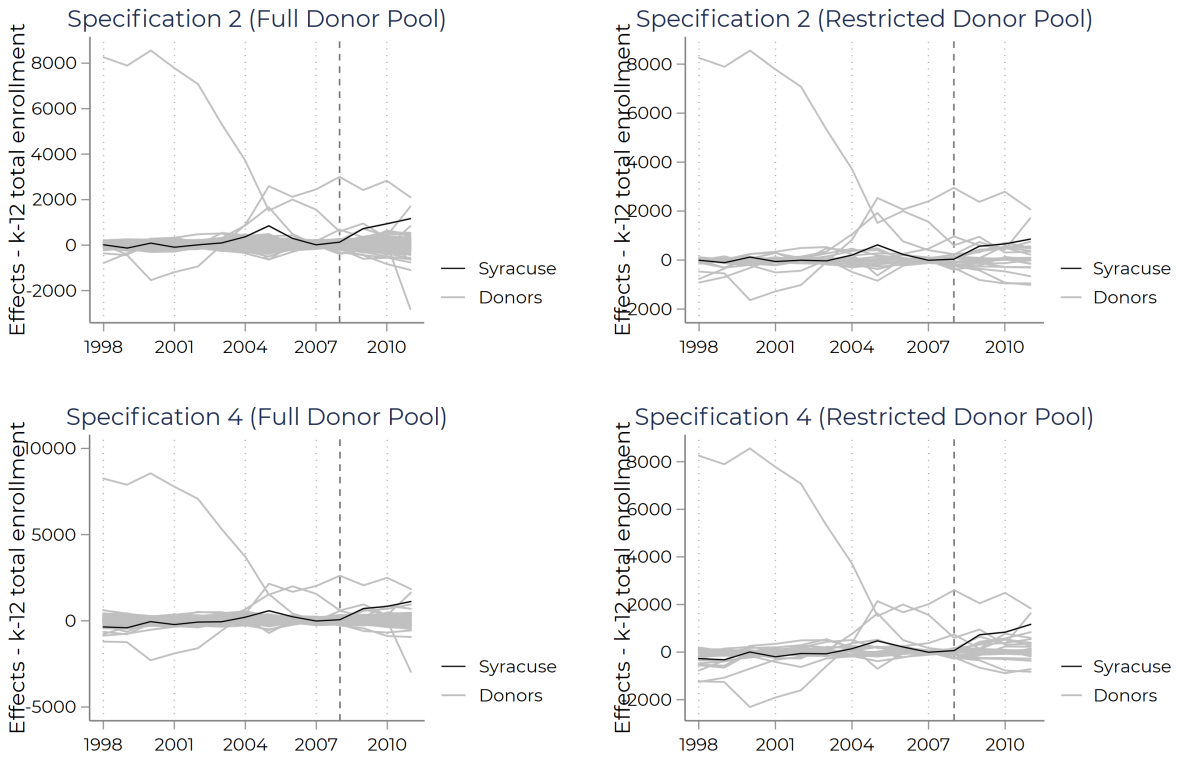
Note: Say Yes to Education implemented in 2008.

Figure 2: Treatment effect on enrollment, Syracuse school district



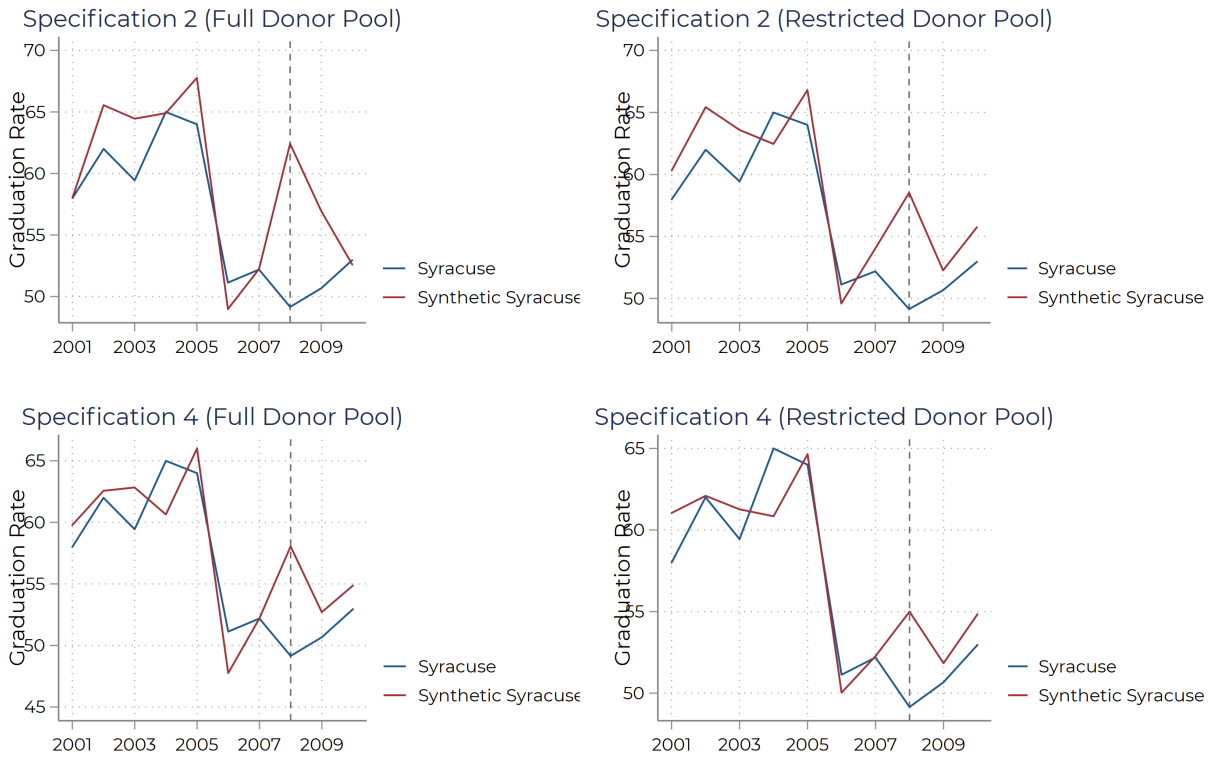
Note: Say Yes to Education implemented in 2008.

Figure 3: Treatment effect on enrollment, Syracuse school district and placebos



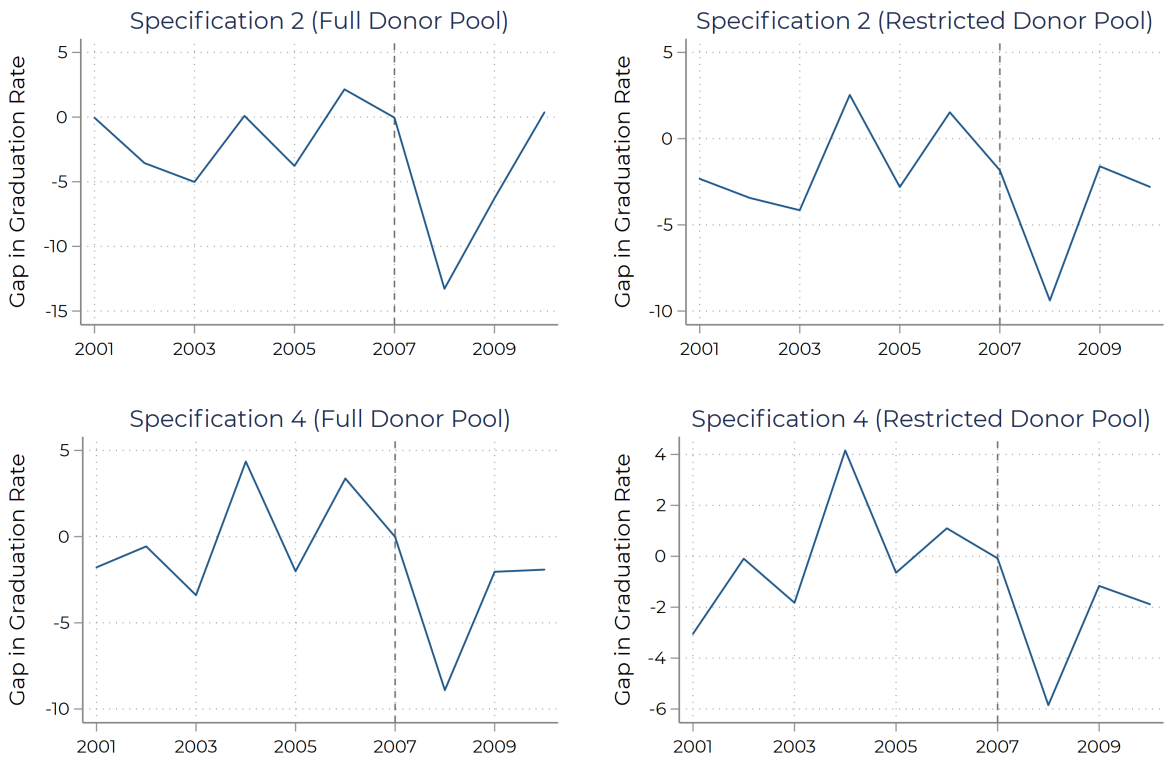
Note: Say Yes to Education implemented in 2008.

Figure 4: Mean graduation rate, Syracuse school district and synthetic control



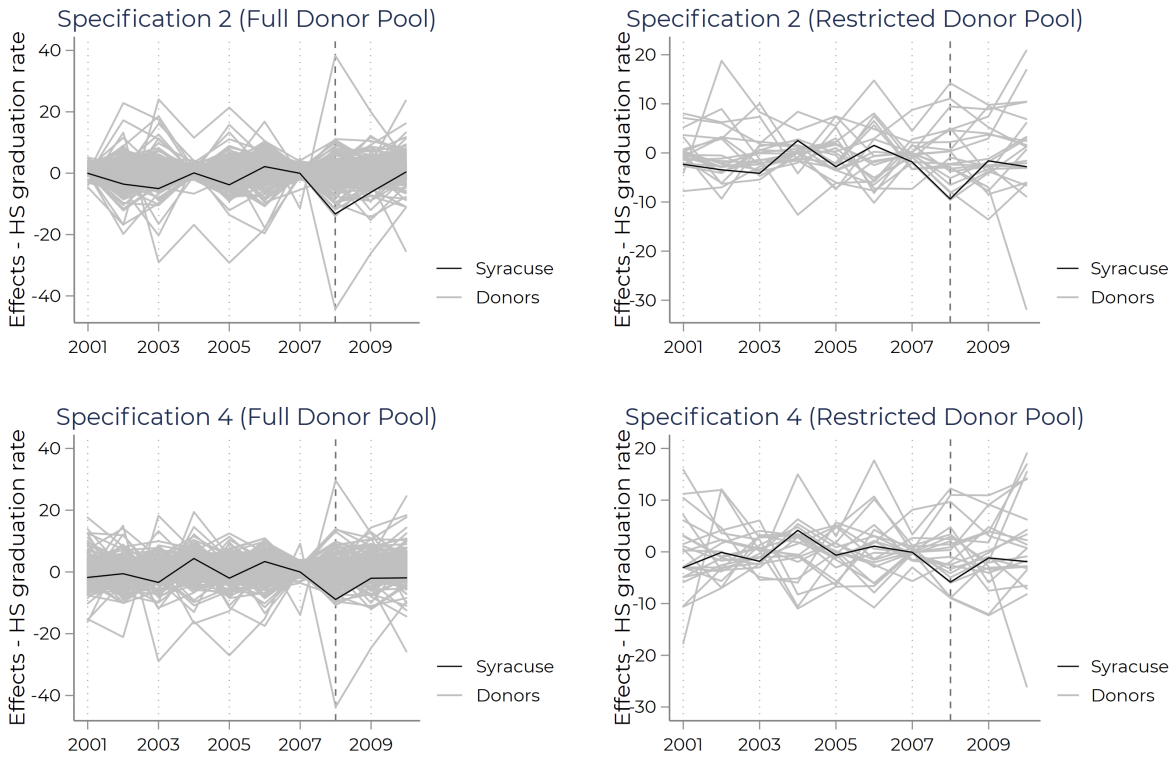
Note: Say Yes to Education implemented in 2008.

Figure 5: Treatment effect on graduation rate, Syracuse school district



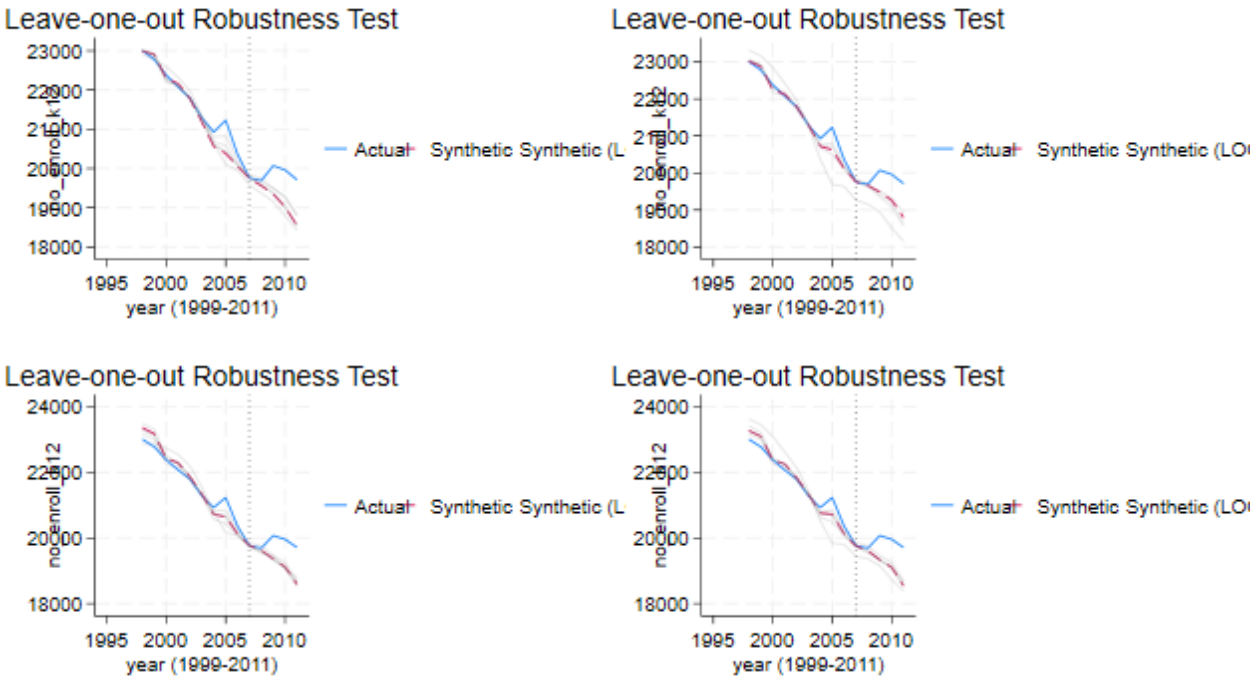
Note: Say Yes to Education implemented in 2008.

Figure 6: Treatment effect on graduation rate, Syracuse school district and placebos



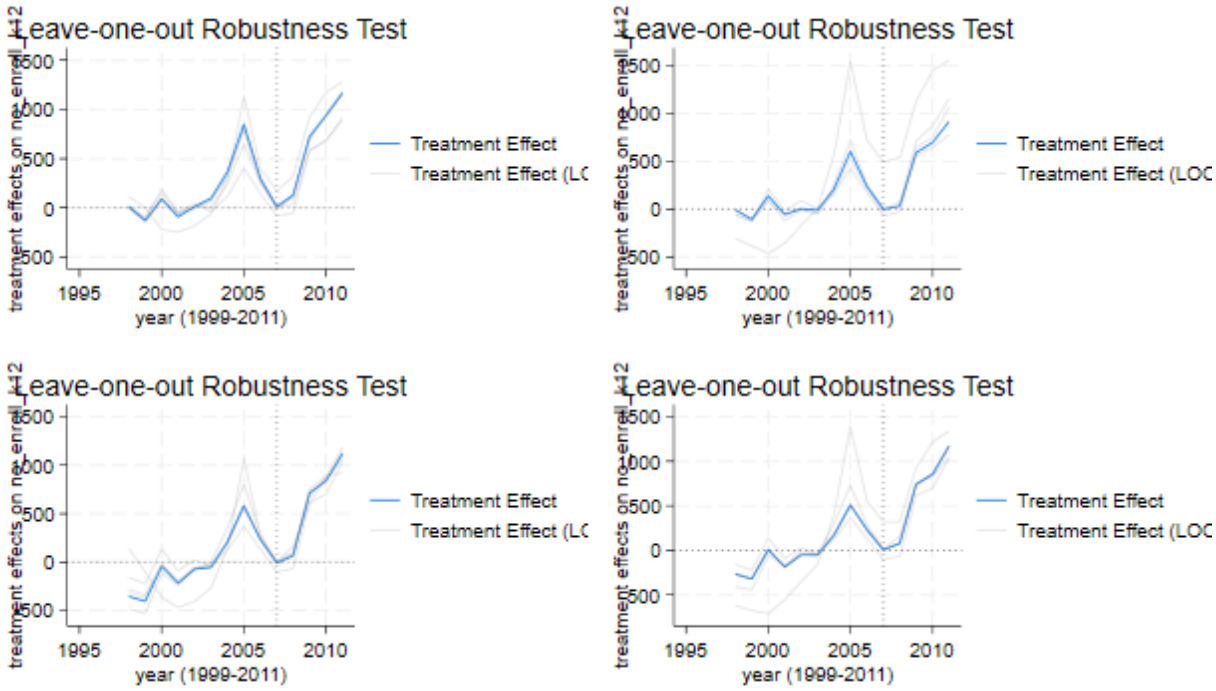
Note: Say Yes to Education implemented in 2008.

Figure 7: Enrollment leave-one-out robustness test



Note: created using `synth2`

Figure 8: Enrollment leave-one-out robustness test



Note: created using `synth2`

```
.
. // ************************************************************************
. // LPO-8852 Problem set 5 solutions
. // Last updated: November 9, 2023
. // ************************************************************************
.
. // ************************************************************************
. // Enrollment data
. // ************************************************************************
.
. // *****************
. // Setup
. // *****************
.
.         use https://github.com/spcorcor18/LPO-8852/raw/main/data/nys_data_enroll.dt
> a, clear

.
.         // There are 276 school districts x 14 years = 3864 observations
.         // Syracuse is id==238
.
.         tabulate year, miss

       year |
(1999-2011) |      Freq.     Percent        Cum.
------------+-----------------------------------
       1998 |        276        7.14        7.14
       1999 |        276        7.14       14.29
       2000 |        276        7.14       21.43
       2001 |        276        7.14       28.57
       2002 |        276        7.14       35.71
       2003 |        276        7.14       42.86
       2004 |        276        7.14       50.00
       2005 |        276        7.14       57.14
       2006 |        276        7.14       64.29
       2007 |        276        7.14       71.43
       2008 |        276        7.14       78.57
       2009 |        276        7.14       85.71
       2010 |        276        7.14       92.86
       2011 |        276        7.14      100.00
------------+-----------------------------------
      Total |      3,864      100.00

.         unique district
Number of unique values of district_name is  276
Number of records is  3864

.         unique id
Number of unique values of id is  276
Number of records is  3864

.         tabulate id if substr(district,1,4)=="SYRA"

group(distr |
  ict_name) |      Freq.     Percent        Cum.
------------+-----------------------------------
        238 |         14      100.00      100.00
------------+-----------------------------------
      Total |         14      100.00

.
.         // District name is too long for use with synth command; try creating a
```

```
.         // truncated version. Also make sure it doesn't vary over time within id.
.
.         by id: gen temp=district_name if _n==1
(3,588 missing values generated)

.         egen district_name2=mode(temp), by(id)

.
.         gen district2=proper(substr(district_name2,1,12))

.         labmask id, values(district2)

.         drop temp district_name2

.
.         xtset id year
       panel variable:  id (strongly balanced)
        time variable:  year, 1998 to 2011
                delta:  1 year

.
.         // ulocal07 codes 11, 12, and 13 are large, midsize, and small cities
.
.         tabulate ulocal07

 local type |
    code (7 |
categories) |
  - numeric |      Freq.     Percent        Cum.
------------+-----------------------------------
         11 |         14        0.36        0.36
         12 |         28        0.72        1.09
         13 |        280        7.25        8.33
         21 |      3,206       82.97       91.30
         22 |        168        4.35       95.65
         23 |        140        3.62       99.28
         32 |         28        0.72      100.00
------------+-----------------------------------
      Total |      3,864      100.00

.         tabulate local07

   locale type |
       code (7 |
 categories) - |
        string |      Freq.     Percent        Cum.
---------------+-----------------------------------
    City-Large |         14        0.36        0.36
  City-Midsize |         28        0.72        1.09
    City-Small |        280        7.25        8.33
  Suburb-Large |      3,206       82.97       91.30
Suburb-Midsize |        168        4.35       95.65
  Suburb-Small |        140        3.62       99.28
  Town-Distant |         28        0.72      100.00
---------------+-----------------------------------
         Total |      3,864      100.00

.
.         // Note: use the dataset's target_donor flag, though not 100% clear
.         // how it is defined. The paper says the restricted donor pool includes
.         // Rochester, Buffalo, Yonkers, and the districts the NYS Association of
.         // Small City School Districts Defines as "small city" districts. Their
.         // n=22 total, although the NYSA says there are 57 small city dists.
```

```
.         // https://www.nyssba.org/clientuploads/nsbmx/forms/small_city_districts.pd
> f
.
.         tabulate year target_donor

      year |
(1999-2011 |     target_donor
         ) |         0          1 |     Total
-----------+----------------------+----------
      1998 |       253         23 |       276
      1999 |       253         23 |       276
      2000 |       253         23 |       276
      2001 |       253         23 |       276
      2002 |       253         23 |       276
      2003 |       253         23 |       276
      2004 |       253         23 |       276
      2005 |       253         23 |       276
      2006 |       253         23 |       276
      2007 |       253         23 |       276
      2008 |       253         23 |       276
      2009 |       253         23 |       276
      2010 |       253         23 |       276
      2011 |       253         23 |       276
-----------+----------------------+----------
     Total |     3,542        322 |     3,864

.         tabulate year small_index

      year |
(1999-2011 |      small_index
         ) |         0          1 |     Total
-----------+----------------------+----------
      1998 |       246         30 |       276
      1999 |       246         30 |       276
      2000 |       246         30 |       276
      2001 |       246         30 |       276
      2002 |       246         30 |       276
      2003 |       246         30 |       276
      2004 |       246         30 |       276
      2005 |       246         30 |       276
      2006 |       246         30 |       276
      2007 |       246         30 |       276
      2008 |       246         30 |       276
      2009 |       246         30 |       276
      2010 |       246         30 |       276
      2011 |       246         30 |       276
-----------+----------------------+----------
     Total |     3,444        420 |     3,864

.
.
. // ******************************************************
. // synth (for weights) and synth_runner (everything else)
. // ******************************************************
.
. // ********************************************************************
. // Specification 2 - full donor pool
. // Predictor variables include pre-treatment outcomes in 1998, 2002, and
. // 2007, as well as p_lunch, p_black, and p_hispanic (each averaged over
. // the full pre-treatment period).
. // ********************************************************************
.
.         synth no_enroll_k12 no_enroll_k12(1998) no_enroll_k12(2002) ///
>                 no_enroll_k12(2007) p_lunch p_black p_hispanic, fig ///
>                 trunit(238) trperiod(2008) keep(espec2.dta) replace
------------------------------------------------------------------------------
Synthetic Control Method for Comparative Case Studies
------------------------------------------------------------------------------
```

First Step: Data Setup

Data Setup successful

Treated Unit: Syracuse Cit

Control Units: Albany City, Alden Centra, Amherst Cent, Amityville U, Ardsley Unio, Babylon Unio, Baldwin Unio, Baldwinsvill, Ballston Spa, Bay Shore Un, Bayport-Blue, Beacon City, Bellmore Uni, Bellmore-Mer, Bethlehem Ce, Bethpage Uni, Binghamton C, Blind Brook-, Brentwood Un, Briarcliff M, Brighton Cen, Brockport Ce, Bronxville U, Brookhaven-C, Buffalo City, Burnt Hills-, Byram Hills, Carle Place, Center Moric, Central Isli, Chappaqua Ce, Cheektowaga, Cheektowaga-, Cheektowaga-, Chenango For, Chenango Val, Clarkstown C, Cleveland Hi, Clinton Cent, Cohoes City, Cold Spring, Commack Unio, Connetquot C, Copiague Uni, Cornwall Cen, Croton-Harmo, Deer Park Un, Depew Union, Dobbs Ferry, Dunkirk City, East Aurora, East Greenbu, East Irondeq, East Islip U, East Meadow, East Moriche, East Quogue, East Ramapo, East Rochest, East Rockawa, East Willist, Eastchester, Eden Central, Edgemont Uni, Elmira City, Elmira Heigh, Elmont Union, Elmsford Uni, Elwood Union, Fairport Cen, Farmingdale, Fayetteville, Floral Park-, Fort Edward, Franklin Squ, Freeport Uni, Frontier Cen, Garden City, Gates-Chili, Glen Cove Ci, Glens Falls, Glens Falls, Grand Island, Great Neck U, Greece Centr, Green Island, Greenburgh C, Greenburgh E, Greenburgh-G, Greenburgh-N, Greenwood La, Guilderland, Half Hollow, Hamburg Cent, Hampton Bays, Harborfields, Harrison Cen, Hastings-On-, Hauppauge Un, Haverstraw-S, Hawthorne-Ce, Hempstead Un, Hendrick Hud, Herricks Uni, Hewlett-Wood, Hicksville U, Highland Cen, Highland Fal, Hilton Centr, Hopevale Uni, Horseheads C, Hudson City, Hudson Falls, Huntington U, Hyde Park Ce, Irvington Un, Island Park, Island Trees, Islip Union, Ithaca City, Jamesville-D, Jericho Unio, Johnson City, Katonah-Lewi, Kenmore-Tona, Kings Park C, Kingston Cit, Kiryas Joel, Lackawanna C, Lakeland Cen, Lancaster Ce, Lansingburgh, Lawrence Uni, Levittown Un, Lindenhurst, Little Flowe, Liverpool Ce, Locust Valle, Long Beach C, Longwood Cen, Lynbrook Uni, Lyncourt Uni, Mahopac Cent, Maine-Endwel, Malverne Uni, Mamaroneck U, Manhasset Un, Marcellus Ce, Marlboro Cen, Massapequa U, Menands Unio, Merrick Unio, Middle Count, Middletown C, Miller Place, Mineola Unio, Mount Pleasa, Mount Pleasa, Mount Pleasa, Mount Sinai, Mount Vernon, Nanuet Union, New Hartford, New Hyde Par, New Rochelle, New York Mil, Newburgh Cit, Niagara Fall, Niskayuna Ce, North Babylo, North Bellmo, North Greenb, North Merric, North Shore, North Syracu, North Tonawa, Northport-Ea, Nyack Union, Oceanside Un, Orchard Park, Oriskany Cen, Ossining Uni, Oyster Bay-E, Patchogue-Me, Pearl River, Peekskill Ci, Pelham Union, Penfield Cen, Phoenix Cent, Pittsford Ce, Plainedge Un, Plainview-Ol, Pleasantvill, Pocantico Hi, Port Chester, Port Jeffers, Port Washing, Poughkeepsie, Putnam Valle, Queensbury U, Ramapo Centr, Remsenburg-S, Rensselaer C, Rochester Ci, Rockville Ce, Rocky Point, Roosevelt Un, Roslyn Union, Rotterdam-Mo, Rush-Henriet, Rye City Sch, Rye Neck Uni, Sachem Centr, Saratoga Spr, Saugerties C, Sayville Uni, Scarsdale Un, Schenectady, Scotia-Glenv, Seaford Unio, Sewanhaka Ce, Shenendehowa, Shoreham-Wad, Smithtown Ce, Solvay Union, Somers Centr, South Coloni, South Countr, South Glens, South Huntin, South Orange, Southampton, Spackenkill, Spencerport, Susquehanna, Sweet Home C, Syosset Cent, Three Villag, Tonawanda Ci, Troy City Sc, Tuckahoe Com, Tuckahoe Uni, Union Free S, Union-Endico, Uniondale Un, Utica City S, Valhalla Uni, Valley Strea, Valley Strea, Valley Strea, Valley Strea, Vestal Centr, Victor Centr, Wallkill Cen, Wantagh Unio, Wappingers C, Washingtonvi, Watervliet C, Webster Cent, West Babylon, West Genesee, West Hempste, West Irondeq, West Islip U, West Seneca, Westbury Uni, Westhampton, Westhill Cen, White Plains, Whitesboro C, William Floy, Williamsvill, Wyandanch Un, Wynantskill, Yonkers City

```
------------------------------------------------------------------------------
          Dependent Variable: no_enroll_k12
  MSPE minimized for periods: 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007
Results obtained for periods: 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008
                              2009 2010 2011
------------------------------------------------------------------------------
                  Predictors: no_enroll_k12(1998) no_enroll_k12(2002)
                              no_enroll_k12(2007) p_lunch p_black p_hispanic
------------------------------------------------------------------------------
Unless period is specified
predictors are averaged over: 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007
------------------------------------------------------------------------------

Second Step: Run Optimization
------------------------------------------------------------------------------
------------------------------------------------------------------------------
Optimization done
------------------------------------------------------------------------------

Third Step: Obtain Results
------------------------------------------------------------------------------
Loss: Root Mean Squared Prediction Error

---------------------
   RMSPE |  308.4825
---------------------
------------------------------------------------------------------------------
Unit Weights:

--------------------------
       Co_No | Unit_Weight
-------------+------------
Albany City  |           0
Alden Centra |           0
Amherst Cent |           0
Amityville U |           0
Ardsley Unio |           0
Babylon Unio |           0
Baldwin Unio |           0
Baldwinsvill |           0
Ballston Spa |           0
Bay Shore Un |           0
Bayport-Blue |           0
Beacon City  |           0
Bellmore Uni |           0
Bellmore-Mer |           0
Bethlehem Ce |           0
Bethpage Uni |           0
Binghamton C |           0
Blind Brook- |           0
Brentwood Un |           0
Briarcliff M |           0
Brighton Cen |           0
Brockport Ce |           0
Bronxville U |           0
Brookhaven-C |           0
Buffalo City |        .167
Burnt Hills- |           0
Byram Hills  |           0
Carle Place  |           0
Center Moric |           0
Central Isli |           0
Chappaqua Ce |           0
Cheektowaga  |           0
Cheektowaga- |           0
Cheektowaga- |           0
Chenango For |           0
Chenango Val |           0
Clarkstown C |           0
Cleveland Hi |           0
Clinton Cent |           0
Cohoes City  |           0
Cold Spring  |           0
Commack Unio |           0
Connetquot C |           0
```

Copiague Uni	0
Cornwall Cen	0
Croton-Harmo	0
Deer Park Un	0
Depew Union	0
Dobbs Ferry	0
Dunkirk City	0
East Aurora	0
East Greenbu	0
East Irondeq	0
East Islip U	0
East Meadow	0
East Moriche	0
East Quogue	0
East Ramapo	0
East Rochest	0
East Rockawa	0
East Willist	0
Eastchester	0
Eden Central	0
Edgemont Uni	0
Elmira City	0
Elmira Heigh	0
Elmont Union	0
Elmsford Uni	0
Elwood Union	0
Fairport Cen	0
Farmingdale	0
Fayetteville	0
Floral Park-	0
Fort Edward	0
Franklin Squ	0
Freeport Uni	0
Frontier Cen	0
Garden City	0
Gates-Chili	0
Glen Cove Ci	0
Glens Falls	0
Glens Falls	0
Grand Island	0
Great Neck U	0
Greece Centr	0
Green Island	0
Greenburgh C	0
Greenburgh E	0
Greenburgh-G	0
Greenburgh-N	0
Greenwood La	0
Guilderland	0
Half Hollow	0
Hamburg Cent	0
Hampton Bays	0
Harborfields	0
Harrison Cen	0
Hastings-On-	0
Hauppauge Un	0
Haverstraw-S	0
Hawthorne-Ce	0
Hempstead Un	0
Hendrick Hud	0
Herricks Uni	0
Hewlett-Wood	0
Hicksville U	0
Highland Cen	0
Highland Fal	0
Hilton Centr	0
Hopevale Uni	.239
Horseheads C	0
Hudson City	0
Hudson Falls	0
Huntington U	0
Hyde Park Ce	0
Irvington Un	0
Island Park	0
Island Trees	0

Islip Union	0
Ithaca City	0
Jamesville-D	0
Jericho Unio	0
Johnson City	0
Katonah-Lewi	0
Kenmore-Tona	0
Kings Park C	0
Kingston Cit	0
Kiryas Joel	0
Lackawanna C	0
Lakeland Cen	0
Lancaster Ce	0
Lansingburgh	0
Lawrence Uni	0
Levittown Un	0
Lindenhurst	0
Little Flowe	0
Liverpool Ce	0
Locust Valle	0
Long Beach C	0
Longwood Cen	0
Lynbrook Uni	0
Lyncourt Uni	0
Mahopac Cent	0
Maine-Endwel	0
Malverne Uni	0
Mamaroneck U	0
Manhasset Un	0
Marcellus Ce	0
Marlboro Cen	0
Massapequa U	0
Menands Unio	0
Merrick Unio	0
Middle Count	0
Middletown C	0
Miller Place	0
Mineola Unio	0
Mount Pleasa	0
Mount Pleasa	0
Mount Pleasa	0
Mount Sinai	0
Mount Vernon	.051
Nanuet Union	0
New Hartford	0
New Hyde Par	0
New Rochelle	0
New York Mil	0
Newburgh Cit	0
Niagara Fall	0
Niskayuna Ce	0
North Babylo	0
North Bellmo	0
North Greenb	0
North Merric	0
North Shore	0
North Syracu	0
North Tonawa	0
Northport-Ea	0
Nyack Union	0
Oceanside Un	0
Orchard Park	0
Oriskany Cen	0
Ossining Uni	0
Oyster Bay-E	0
Patchogue-Me	0
Pearl River	0
Peekskill Ci	0
Pelham Union	0
Penfield Cen	0
Phoenix Cent	0
Pittsford Ce	0
Plainedge Un	0
Plainview-Ol	0
Pleasantvill	0

Pocantico Hi	0
Port Chester	0
Port Jeffers	0
Port Washing	0
Poughkeepsie	0
Putnam Valle	0
Queensbury U	0
Ramapo Centr	0
Remsenburg-S	0
Rensselaer C	0
Rochester Ci	.363
Rockville Ce	0
Rocky Point	0
Roosevelt Un	0
Roslyn Union	0
Rotterdam-Mo	0
Rush-Henriet	0
Rye City Sch	0
Rye Neck Uni	0
Sachem Centr	0
Saratoga Spr	0
Saugerties C	0
Sayville Uni	0
Scarsdale Un	0
Schenectady	0
Scotia-Glenv	0
Seaford Unio	0
Sewanhaka Ce	0
Shenendehowa	0
Shoreham-Wad	0
Smithtown Ce	.179
Solvay Union	0
Somers Centr	0
South Coloni	0
South Countr	0
South Glens	0
South Huntin	0
South Orange	0
Southampton	0
Spackenkill	0
Spencerport	0
Susquehanna	0
Sweet Home C	0
Syosset Cent	0
Three Villag	0
Tonawanda Ci	0
Troy City Sc	0
Tuckahoe Com	0
Tuckahoe Uni	0
Union Free S	0
Union-Endico	0
Uniondale Un	0
Utica City S	0
Valhalla Uni	0
Valley Strea	0
Valley Strea	0
Valley Strea	0
Valley Strea	0
Vestal Centr	0
Victor Centr	0
Wallkill Cen	0
Wantagh Unio	0
Wappingers C	0
Washingtonvi	0
Watervliet C	0
Webster Cent	0
West Babylon	0
West Genesee	0
West Hempste	0
West Irondeq	0
West Islip U	0
West Seneca	0
Westbury Uni	0
Westhampton	0
Westhill Cen	0

```
White Plains |           0
Whitesboro C |           0
William Floy |           0
Williamsvill |           0
Wyandanch Un |           0
Wynantskill  |           0
Yonkers City |           0
-------------------------
------------------------------------------------------------------------------------------
Predictor Balance:

-----------------------------------------------------
                             |   Treated  Synthetic
-----------------------------+-----------------------
          no_enroll_k12(1998) |     23009   22994.95
          no_enroll_k12(2002) |     21796   21782.82
          no_enroll_k12(2007) |     19759   19746.57
                      p_lunch |  .6088626   .6028755
                      p_black |  .4749719   .4560302
                    p_hispanic |  .0775515   .1156989
-----------------------------------------------------
------------------------------------------------------------------------------------------


.
.         graph save Graph enrollmentspec2a, replace
(note: file enrollmentspec2a.gph not found)
(file enrollmentspec2a.gph saved)

.
.         synth_runner no_enroll_k12 no_enroll_k12(1998) no_enroll_k12(2002) ///
>                 no_enroll_k12(2007) p_lunch p_black p_hispanic, ///
>                 trunit(238) trperiod(2008) gen_vars keep(espec2b.dta) replace
Estimating the treatment effects
Estimating the possible placebo effects (one set for each of the 1 treatment periods)
----+--- 1 ---+--- 2 ---+--- 3 ---+--- 4 ---+--- 5 Total: 275
.................................................. 1.98m elapsed. 8.90m remaining
.................................................. 3.97m elapsed. 6.95m remaining
.................................................. 5.95m elapsed. 4.95m remaining
.................................................. 7.92m elapsed. 2.97m remaining
.................................................. 9.92m elapsed. 60.00s remaining
.....................| 10.90m elapsed.

Conducting inference: 5 steps, and 275 placebo averages
Step 1... Finished
Step 2... Finished
Step 3... Finished
Step 4... Finished
Step 5... Finished

Post-treatment results: Effects, p-values, standardized p-values

             | estimates      pvals  pvals_std
-------------+----------------------------------
          c1 |   130.741   .1890909   .7854545
          c2 |   725.187   .0072727   .3527273
          c3 |   938.759   .0036364   .3127273
          c4 |  1164.145   .0109091        .32

.
.         // see saved statistics, save pvals to a matrix
.
.         ereturn list

scalars:
               e(n_pl) =  275
          e(n_pl_used) =  275
    e(pval_joint_post) =  .0109090909090909
  e(pval_joint_post_s
    td)                =  .3963636363636364
    e(avg_pre_rmspe_p) =  .0145454545454545
```

```
macros:
           e(trperiod) : "2008"
             e(trunit) : "238"
         e(treat_type) : "single unit"
             e(depvar) : "no_enroll_k12"
                e(cmd) : "synth_runner"
         e(properties) : "b"

matrices:
                  e(b) :  1 x 4
          e(pvals_std) :  1 x 4
              e(pvals) :  1 x 4
      e(treat_control) :  14 x 2

.         matrix p2 = e(pvals)

.
.         // get standard plot of means, as well as gap between TX and
.         // synthetic control
.
.         effect_graphs, treated_name(Syracuse) sc_name(Synthetic Syracuse) ///
>                 tc_gname(syr1) tc_ytitle(K-12 enrollment) ///
>                 tc_options(title("Specification 2 (Full Donor Pool)") ///
>                         xlabel(1998(3)2011) xtitle("") nodraw) ///
>                 effect_gname(syr2) effect_ytitle(Gap in K-12 enrollment) ///
>                 effect_options(title("Specification 2 (Full Donor Pool)") ///
>                         xlabel(1998(3)2011) xtitle("") nodraw) trlinediff(0)

.
.         graph save syr1 enrollmentspec2, replace
(note: file enrollmentspec2.gph not found)
(file enrollmentspec2.gph saved)

.         graph save syr2 enrollmentspec2gap, replace
(note: file enrollmentspec2gap.gph not found)
(file enrollmentspec2gap.gph saved)

.
.         // plot the gap for TX vs all of the placebos
.         // Note: this command does not appear to have an option to include
.         // donors with particularly bad pre-treatment fits.
.
.         single_treatment_graphs, do_color(gs12) treated_name(Syracuse) ///
>                 raw_gname(syr3) raw_options(title("Specification 2 (Full Donor Pool
> )") ///
>                         xlabel(1998(3)2011) xtitle("") nodraw) ///
>                 effects_gname(syr4) effects_options(title("Specification 2 (Full Do
> nor Pool)") ///
>                         xlabel(1998(3)2011) xtitle("") nodraw) trlinediff(0)

.
.         graph save syr3 enrollmentspec2placebo, replace
(note: file enrollmentspec2placebo.gph not found)
(file enrollmentspec2placebo.gph saved)

.         graph save syr4 enrollmentspec2placebogap, replace
(note: file enrollmentspec2placebogap.gph not found)
(file enrollmentspec2placebogap.gph saved)

.
.         // plot pvalue by time period
.
.         pval_graphs, pvals_options(title("Specification 2 (Full Donor Pool): pvalue
> s") xtitle("") nodraw) ///
>                  pvals_std_options(title("Specification 2 (Full Donor Pool): pvalue
> s (std)") xtitle("") nodraw)
```

```
.
.         graph save pvals enrollmentspec2pvals, replace
(note: file enrollmentspec2pvals.gph not found)
(file enrollmentspec2pvals.gph saved)

.         graph save pvals_std enrollmentspec2pvalsstd, replace
(note: file enrollmentspec2pvalsstd.gph not found)
(file enrollmentspec2pvalsstd.gph saved)

.
.         drop pre_rmspe - no_enroll_k12_synth

.
.
. // ***************************************************************************
. // Specification 2 - restricted donor pool
. // ***************************************************************************
.
.         preserve

.         keep if target_donor==1
(3,542 observations deleted)

.
.         synth no_enroll_k12 no_enroll_k12(1998) no_enroll_k12(2002) ///
>                 no_enroll_k12(2007) p_lunch p_black p_hispanic, fig ///
>                 trunit(238) trperiod(2008) keep(espec2r.dta) replace
------------------------------------------------------------------------------
Synthetic Control Method for Comparative Case Studies
------------------------------------------------------------------------------

First Step: Data Setup
------------------------------------------------------------------------------
------------------------------------------------------------------------------
Data Setup successful
------------------------------------------------------------------------------
                Treated Unit: Syracuse Cit
              Control Units: Albany City, Amityville U, Brentwood Un, Buffalo City,
                             Central Isli, Dunkirk City, East Ramapo, Hempstead Un,
                             Hudson City, Middletown C, Mount Vernon, Newburgh Cit,
                             Niagara Fall, Poughkeepsie, Rochester Ci, Roosevelt Un,
                             Schenectady, Troy City Sc, Utica City S, Westbury Uni,
                             Wyandanch Un, Yonkers City
------------------------------------------------------------------------------
          Dependent Variable: no_enroll_k12
  MSPE minimized for periods: 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007
Results obtained for periods: 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008
                              2009 2010 2011
------------------------------------------------------------------------------
                 Predictors: no_enroll_k12(1998) no_enroll_k12(2002)
                             no_enroll_k12(2007) p_lunch p_black p_hispanic
------------------------------------------------------------------------------
Unless period is specified
predictors are averaged over: 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007
------------------------------------------------------------------------------

Second Step: Run Optimization
------------------------------------------------------------------------------
------------------------------------------------------------------------------
Optimization done
------------------------------------------------------------------------------

Third Step: Obtain Results
------------------------------------------------------------------------------
Loss: Root Mean Squared Prediction Error

----------------------
   RMSPE |  229.5569
----------------------
------------------------------------------------------------------------------
Unit Weights:
```

```
-------------------------
       Co_No | Unit_Weight
-------------+-----------
Albany City  |        .048
Amityville U |          0
Brentwood Un |          0
Buffalo City |        .088
Central Isli |          0
Dunkirk City |          0
East Ramapo  |          0
Hempstead Un |          0
Hudson City  |          0
Middletown C |          0
Mount Vernon |          0
Newburgh Cit |          0
Niagara Fall |         .24
Poughkeepsie |          0
Rochester Ci |        .392
Roosevelt Un |          0
Schenectady  |          0
Troy City Sc |          0
Utica City S |        .233
Westbury Uni |          0
Wyandanch Un |          0
Yonkers City |          0
-------------------------
------------------------------------------------------------------------------------------
Predictor Balance:

------------------------------------------------------
                              |   Treated  Synthetic
------------------------------+-----------------------
           no_enroll_k12(1998) |     23009   23014.01
           no_enroll_k12(2002) |     21796   21801.61
           no_enroll_k12(2007) |     19759    19766.1
                     p_lunch |  .6088626   .5930815
                     p_black |  .4749719   .4687098
                  p_hispanic |  .0775515   .1220871
------------------------------------------------------
------------------------------------------------------------------------------------------

.
.         graph save Graph enrollmentspec2ra, replace
(note: file enrollmentspec2ra.gph not found)
(file enrollmentspec2ra.gph saved)

.
.         synth_runner no_enroll_k12 no_enroll_k12(1998) no_enroll_k12(2002) ///
>                 no_enroll_k12(2007) p_lunch p_black p_hispanic, ///
>                 trunit(238) trperiod(2008) gen_vars keep(espec2rb.dta) replace
Estimating the treatment effects
Estimating the possible placebo effects (one set for each of the 1 treatment periods)
|                    | Total: 22
.....................| 4.00s elapsed.

Conducting inference: 5 steps, and 22 placebo averages
Step 1... Finished
Step 2... Finished
Step 3... Finished
Step 4... Finished
Step 5... Finished

Post-treatment results: Effects, p-values, standardized p-values

             | estimates      pvals  pvals_std
-------------+---------------------------------
          c1 |    35.505          1   .9545455
          c2 |   565.986   .2272727   .2727273
          c3 |   660.655   .1818182   .3181818
          c4 |   855.901   .1818182   .1818182
```

```
.
.         // see saved statistics, save pvals to a matrix
.
.         ereturn list

scalars:
              e(n_pl) =  22
         e(n_pl_used) =  22
    e(pval_joint_post) =  .2272727272727273
  e(pval_joint_post_s
    td)              =  .2272727272727273
    e(avg_pre_rmspe_p) =  .3636363636363636

macros:
           e(trperiod) : "2008"
             e(trunit) : "238"
         e(treat_type) : "single unit"
             e(depvar) : "no_enroll_k12"
                e(cmd) : "synth_runner"
         e(properties) : "b"

matrices:
                  e(b) :  1 x 4
          e(pvals_std) :  1 x 4
              e(pvals) :  1 x 4
      e(treat_control) :  14 x 2

.         matrix p2r = e(pvals)

.
.         // get standard plot of means, as well as gap between TX and/
.         // synthetic control
.
.         effect_graphs, treated_name(Syracuse) sc_name(Synthetic Syracuse) ///
>                 tc_gname(syr1) tc_ytitle(K-12 enrollment) ///
>                 tc_options(title("Specification 2 (Restricted Donor Pool)") ///
>                         xlabel(1998(3)2011) xtitle("") nodraw) ///
>                 effect_gname(syr2)  effect_ytitle(Gap in K-12 enrollment) ///
>                 effect_options(title("Specification 2 (Restricted Donor Pool)") ///
>                         xlabel(1998(3)2011) xtitle("") nodraw) ///
>                 trlinediff(0)

.
.         graph save syr1 enrollmentspec2r, replace
(note: file enrollmentspec2r.gph not found)
(file enrollmentspec2r.gph saved)

.         graph save syr2 enrollmentspec2rgap, replace
(note: file enrollmentspec2rgap.gph not found)
(file enrollmentspec2rgap.gph saved)

.
.         // plot the gap for TX vs all of the placebos
.
.         single_treatment_graphs, do_color(gs12) treated_name(Syracuse) ///
>                 raw_gname(syr3) raw_options(title("Specification 2 (Restricted Dono
> r Pool)") ///
>                         xlabel(1998(3)2011) xtitle("") nodraw) ///
>                 effects_gname(syr4) effects_options(title("Specification 2 (Restric
> ted Donor Pool)") ///
>                         xlabel(1998(3)2011) xtitle("") nodraw) trlinediff(0)

.
```

```
.         graph save syr3 enrollmentspec2rplacebo, replace
(note: file enrollmentspec2rplacebo.gph not found)
(file enrollmentspec2rplacebo.gph saved)

.         graph save syr4 enrollmentspec2rplacebogap, replace
(note: file enrollmentspec2rplacebogap.gph not found)
(file enrollmentspec2rplacebogap.gph saved)

.
.         // plot pvalue by time period
.
.         pval_graphs, pvals_options(title("Specification 2 (Restricted Donor Pool):
> pvalues") xtitle("") nodraw) ///
>                  pvals_std_options(title("Specification 2 (Restricted Donor Pool):
> pvalues (std)") xtitle("") nodraw)

.
.         graph save pvals enrollmentspec2rpvals, replace
(note: file enrollmentspec2rpvals.gph not found)
(file enrollmentspec2rpvals.gph saved)

.         graph save pvals_std enrollmentspec2rpvalsstd, replace
(note: file enrollmentspec2rpvalsstd.gph not found)
(file enrollmentspec2rpvalsstd.gph saved)

.
.         drop pre_rmspe - no_enroll_k12_synth

.         restore

.
.
. // ***********************************************************************
. // Specification 4 - full donor pool
. // Predictor variables include pre-treatment outcomes in 2007 and an
. // average over the 1998-2006 period, as well as p_lunch, p_black,
. // and p_hispanic (each averaged over the full pre-treatment period).
. // ***********************************************************************
.
.         synth no_enroll_k12 no_enroll_k12(1998(1)2006) no_enroll_k12(2007) ///
>                 p_lunch p_black p_hispanic, fig ///
>                 trunit(238) trperiod(2008) keep(espec4.dta) replace
-------------------------------------------------------------------------------
Synthetic Control Method for Comparative Case Studies
-------------------------------------------------------------------------------

First Step: Data Setup
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
Data Setup successful
-------------------------------------------------------------------------------
               Treated Unit: Syracuse Cit
             Control Units: Albany City, Alden Centra, Amherst Cent, Amityville U,
                            Ardsley Unio, Babylon Unio, Baldwin Unio, Baldwinsvill,
                            Ballston Spa, Bay Shore Un, Bayport-Blue, Beacon City,
                            Bellmore Uni, Bellmore-Mer, Bethlehem Ce, Bethpage Uni,
                            Binghamton C, Blind Brook-, Brentwood Un, Briarcliff M,
                            Brighton Cen, Brockport Ce, Bronxville U, Brookhaven-C,
                            Buffalo City, Burnt Hills-, Byram Hills, Carle Place,
                            Center Moric, Central Isli, Chappaqua Ce, Cheektowaga,
                            Cheektowaga-, Cheektowaga-, Chenango For, Chenango Val,
                            Clarkstown C, Cleveland Hi, Clinton Cent, Cohoes City,
                            Cold Spring, Commack Unio, Connetquot C, Copiague Uni,
                            Cornwall Cen, Croton-Harmo, Deer Park Un, Depew Union,
                            Dobbs Ferry, Dunkirk City, East Aurora, East Greenbu,
                            East Irondeq, East Islip U, East Meadow, East Moriche,
                            East Quogue, East Ramapo, East Rochest, East Rockawa,
                            East Willist, Eastchester, Eden Central, Edgemont Uni,
                            Elmira City, Elmira Heigh, Elmont Union, Elmsford Uni,
                            Elwood Union, Fairport Cen, Farmingdale, Fayetteville,
                            Floral Park-, Fort Edward, Franklin Squ, Freeport Uni,
                            Frontier Cen, Garden City, Gates-Chili, Glen Cove Ci,
                            Glens Falls, Glens Falls, Grand Island, Great Neck U,
                            Greece Centr, Green Island, Greenburgh C, Greenburgh E,
                            Greenburgh-G, Greenburgh-N, Greenwood La, Guilderland,
```

```
                              Half Hollow, Hamburg Cent, Hampton Bays, Harborfields,
                              Harrison Cen, Hastings-On-, Hauppauge Un, Haverstraw-S,
                              Hawthorne-Ce, Hempstead Un, Hendrick Hud, Herricks Uni,
                              Hewlett-Wood, Hicksville U, Highland Cen, Highland Fal,
                              Hilton Centr, Hopevale Uni, Horseheads C, Hudson City,
                              Hudson Falls, Huntington U, Hyde Park Ce, Irvington Un,
                              Island Park, Island Trees, Islip Union, Ithaca City,
                              Jamesville-D, Jericho Unio, Johnson City, Katonah-Lewi,
                              Kenmore-Tona, Kings Park C, Kingston Cit, Kiryas Joel,
                              Lackawanna C, Lakeland Cen, Lancaster Ce, Lansingburgh,
                              Lawrence Uni, Levittown Un, Lindenhurst, Little Flowe,
                              Liverpool Ce, Locust Valle, Long Beach C, Longwood Cen,
                              Lynbrook Uni, Lyncourt Uni, Mahopac Cent, Maine-Endwel,
                              Malverne Uni, Mamaroneck U, Manhasset Un, Marcellus Ce,
                              Marlboro Cen, Massapequa U, Menands Unio, Merrick Unio,
                              Middle Count, Middletown C, Miller Place, Mineola Unio,
                              Mount Pleasa, Mount Pleasa, Mount Pleasa, Mount Sinai,
                              Mount Vernon, Nanuet Union, New Hartford, New Hyde Par,
                              New Rochelle, New York Mil, Newburgh Cit, Niagara Fall,
                              Niskayuna Ce, North Babylo, North Bellmo, North Greenb,
                              North Merric, North Shore, North Syracu, North Tonawa,
                              Northport-Ea, Nyack Union, Oceanside Un, Orchard Park,
                              Oriskany Cen, Ossining Uni, Oyster Bay-E, Patchogue-Me,
                              Pearl River, Peekskill Ci, Pelham Union, Penfield Cen,
                              Phoenix Cent, Pittsford Ce, Plainedge Un, Plainview-Ol,
                              Pleasantvill, Pocantico Hi, Port Chester, Port Jeffers,
                              Port Washing, Poughkeepsie, Putnam Valle, Queensbury U,
                              Ramapo Centr, Remsenburg-S, Rensselaer C, Rochester Ci,
                              Rockville Ce, Rocky Point, Roosevelt Un, Roslyn Union,
                              Rotterdam-Mo, Rush-Henriet, Rye City Sch, Rye Neck Uni,
                              Sachem Centr, Saratoga Spr, Saugerties C, Sayville Uni,
                              Scarsdale Un, Schenectady, Scotia-Glenv, Seaford Unio,
                              Sewanhaka Ce, Shenendehowa, Shoreham-Wad, Smithtown Ce,
                              Solvay Union, Somers Centr, South Coloni, South Countr,
                              South Glens, South Huntin, South Orange, Southampton,
                              Spackenkill, Spencerport, Susquehanna, Sweet Home C,
                              Syosset Cent, Three Villag, Tonawanda Ci, Troy City Sc,
                              Tuckahoe Com, Tuckahoe Uni, Union Free S, Union-Endico,
                              Uniondale Un, Utica City S, Valhalla Uni, Valley Strea,
                              Valley Strea, Valley Strea, Valley Strea, Vestal Centr,
                              Victor Centr, Wallkill Cen, Wantagh Unio, Wappingers C,
                              Washingtonvi, Watervliet C, Webster Cent, West Babylon,
                              West Genesee, West Hempste, West Irondeq, West Islip U,
                              West Seneca, Westbury Uni, Westhampton, Westhill Cen,
                              White Plains, Whitesboro C, William Floy, Williamsvill,
                              Wyandanch Un, Wynantskill, Yonkers City
--------------------------------------------------------------------------------
          Dependent Variable: no_enroll_k12
  MSPE minimized for periods: 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007
Results obtained for periods: 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008
                              2009 2010 2011
--------------------------------------------------------------------------------
                  Predictors: no_enroll_k12(1998(1)2006) no_enroll_k12(2007) p_lunch
                              p_black p_hispanic
--------------------------------------------------------------------------------
Unless period is specified
predictors are averaged over: 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007
--------------------------------------------------------------------------------

Second Step: Run Optimization
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
Optimization done
--------------------------------------------------------------------------------

Third Step: Obtain Results
--------------------------------------------------------------------------------
Loss: Root Mean Squared Prediction Error

---------------------
   RMSPE |  278.8925
---------------------
--------------------------------------------------------------------------------
Unit Weights:
```

Co_No	Unit_Weight
Albany City	0
Alden Centra	0
Amherst Cent	0
Amityville U	0
Ardsley Unio	0
Babylon Unio	0
Baldwin Unio	0
Baldwinsvill	0
Ballston Spa	0
Bay Shore Un	0
Bayport-Blue	0
Beacon City	0
Bellmore Uni	0
Bellmore-Mer	0
Bethlehem Ce	0
Bethpage Uni	0
Binghamton C	0
Blind Brook-	0
Brentwood Un	0
Briarcliff M	0
Brighton Cen	0
Brockport Ce	0
Bronxville U	0
Brookhaven-C	0
Buffalo City	.065
Burnt Hills-	0
Byram Hills	0
Carle Place	0
Center Moric	0
Central Isli	0
Chappaqua Ce	0
Cheektowaga	0
Cheektowaga-	0
Cheektowaga-	0
Chenango For	0
Chenango Val	0
Clarkstown C	0
Cleveland Hi	0
Clinton Cent	0
Cohoes City	0
Cold Spring	0
Commack Unio	0
Connetquot C	0
Copiague Uni	0
Cornwall Cen	0
Croton-Harmo	0
Deer Park Un	0
Depew Union	0
Dobbs Ferry	0
Dunkirk City	0
East Aurora	0
East Greenbu	0
East Irondeq	0
East Islip U	0
East Meadow	0
East Moriche	0
East Quogue	0
East Ramapo	0
East Rochest	0
East Rockawa	0
East Willist	0
Eastchester	0
Eden Central	0
Edgemont Uni	0
Elmira City	.148
Elmira Heigh	0
Elmont Union	0
Elmsford Uni	0
Elwood Union	0
Fairport Cen	0
Farmingdale	0
Fayetteville	0

Floral Park-	0
Fort Edward	0
Franklin Squ	0
Freeport Uni	0
Frontier Cen	0
Garden City	0
Gates-Chili	0
Glen Cove Ci	0
Glens Falls	0
Glens Falls	0
Grand Island	0
Great Neck U	0
Greece Centr	0
Green Island	0
Greenburgh C	0
Greenburgh E	0
Greenburgh-G	0
Greenburgh-N	0
Greenwood La	0
Guilderland	0
Half Hollow	0
Hamburg Cent	0
Hampton Bays	0
Harborfields	0
Harrison Cen	0
Hastings-On-	0
Hauppauge Un	0
Haverstraw-S	0
Hawthorne-Ce	0
Hempstead Un	0
Hendrick Hud	0
Herricks Uni	0
Hewlett-Wood	0
Hicksville U	0
Highland Cen	0
Highland Fal	0
Hilton Centr	0
Hopevale Uni	.021
Horseheads C	0
Hudson City	0
Hudson Falls	0
Huntington U	0
Hyde Park Ce	0
Irvington Un	0
Island Park	0
Island Trees	0
Islip Union	0
Ithaca City	0
Jamesville-D	0
Jericho Unio	0
Johnson City	0
Katonah-Lewi	0
Kenmore-Tona	0
Kings Park C	0
Kingston Cit	0
Kiryas Joel	0
Lackawanna C	0
Lakeland Cen	0
Lancaster Ce	0
Lansingburgh	0
Lawrence Uni	0
Levittown Un	0
Lindenhurst	0
Little Flowe	0
Liverpool Ce	0
Locust Valle	0
Long Beach C	0
Longwood Cen	0
Lynbrook Uni	0
Lyncourt Uni	0
Mahopac Cent	0
Maine-Endwel	0
Malverne Uni	0
Mamaroneck U	0
Manhasset Un	0

Marcellus Ce	0
Marlboro Cen	0
Massapequa U	0
Menands Unio	0
Merrick Unio	0
Middle Count	0
Middletown C	0
Miller Place	0
Mineola Unio	0
Mount Pleasa	0
Mount Pleasa	0
Mount Pleasa	0
Mount Sinai	0
Mount Vernon	0
Nanuet Union	0
New Hartford	0
New Hyde Par	0
New Rochelle	0
New York Mil	0
Newburgh Cit	0
Niagara Fall	.324
Niskayuna Ce	0
North Babylo	0
North Bellmo	0
North Greenb	0
North Merric	0
North Shore	0
North Syracu	0
North Tonawa	0
Northport-Ea	0
Nyack Union	0
Oceanside Un	0
Orchard Park	0
Oriskany Cen	0
Ossining Uni	0
Oyster Bay-E	0
Patchogue-Me	0
Pearl River	0
Peekskill Ci	0
Pelham Union	0
Penfield Cen	0
Phoenix Cent	0
Pittsford Ce	0
Plainedge Un	0
Plainview-Ol	0
Pleasantvill	0
Pocantico Hi	0
Port Chester	0
Port Jeffers	0
Port Washing	0
Poughkeepsie	0
Putnam Valle	0
Queensbury U	0
Ramapo Centr	0
Remsenburg-S	0
Rensselaer C	0
Rochester Ci	.442
Rockville Ce	0
Rocky Point	0
Roosevelt Un	0
Roslyn Union	0
Rotterdam-Mo	0
Rush-Henriet	0
Rye City Sch	0
Rye Neck Uni	0
Sachem Centr	0
Saratoga Spr	0
Saugerties C	0
Sayville Uni	0
Scarsdale Un	0
Schenectady	0
Scotia-Glenv	0
Seaford Unio	0
Sewanhaka Ce	0
Shenendehowa	0

```
Shoreham-Wad |           0
Smithtown Ce |           0
Solvay Union |           0
Somers Centr |           0
South Coloni |           0
South Countr |           0
South Glens  |           0
South Huntin |           0
South Orange |           0
Southampton  |           0
Spackenkill  |           0
Spencerport  |           0
Susquehanna  |           0
Sweet Home C |           0
Syosset Cent |           0
Three Villag |           0
Tonawanda Ci |           0
Troy City Sc |           0
Tuckahoe Com |           0
Tuckahoe Uni |           0
Union Free S |           0
Union-Endico |           0
Uniondale Un |           0
Utica City S |           0
Valhalla Uni |           0
Valley Strea |           0
Valley Strea |           0
Valley Strea |           0
Valley Strea |           0
Vestal Centr |           0
Victor Centr |           0
Wallkill Cen |           0
Wantagh Unio |           0
Wappingers C |           0
Washingtonvi |           0
Watervliet C |           0
Webster Cent |           0
West Babylon |           0
West Genesee |           0
West Hempste |           0
West Irondeq |           0
West Islip U |           0
West Seneca  |           0
Westbury Uni |           0
Westhampton  |           0
Westhill Cen |           0
White Plains |           0
Whitesboro C |           0
William Floy |           0
Williamsvill |           0
Wyandanch Un |           0
Wynantskill  |           0
Yonkers City |           0
-------------------------
```

Predictor Balance:

	Treated	Synthetic
no_enroll_k12(1998(1)2006)	21761.33	21773.74
no_enroll_k12(2007)	19759	19768.88
p_lunch	.6088626	.5555469
p_black	.4749719	.4537741
p_hispanic	.0775515	.1031374

```
.
.         graph save Graph enrollmentspec4a, replace
(note: file enrollmentspec4a.gph not found)
(file enrollmentspec4a.gph saved)

.
.         synth_runner no_enroll_k12 no_enroll_k12(1998(1)2006) no_enroll_k12(2007) /
> //
>                 p_lunch p_black p_hispanic, ///
>                 trunit(238) trperiod(2008) gen_vars keep(espec4b.dta) replace
Estimating the treatment effects
Estimating the possible placebo effects (one set for each of the 1 treatment periods)
----+--- 1 ---+--- 2 ---+--- 3 ---+--- 4 ---+--- 5 Total: 275
.................................................. 84.00s elapsed. 6.27m remaining
.................................................. 2.80m elapsed. 4.88m remaining
.................................................. 4.20m elapsed. 3.50m remaining
.................................................. 5.58m elapsed. 2.10m remaining
.................................................. 6.97m elapsed. 42.00s remaining
.....................| 7.68m elapsed.

Conducting inference: 5 steps, and 275 placebo averages
Step 1... Finished
Step 2... Finished
Step 3... Finished
Step 4... Finished
Step 5... Finished

Post-treatment results: Effects, p-values, standardized p-values

             | estimates      pvals  pvals_std
-------------+----------------------------------
          c1 |    66.861   .5163636   .8327273
          c2 |   712.928   .0072727         .24
          c3 |   839.614   .0109091   .2327273
          c4 |  1120.696   .0109091   .2109091

.
.         // see saved statistics, save pvals to a matrix
.
.         ereturn list

scalars:
               e(n_pl) =  275
          e(n_pl_used) =  275
    e(pval_joint_post) =  .0109090909090909
  e(pval_joint_post_s
    td)                =  .2690909090909091
    e(avg_pre_rmspe_p) =  .0254545454545455

macros:
           e(trperiod) : "2008"
             e(trunit) : "238"
         e(treat_type) : "single unit"
             e(depvar) : "no_enroll_k12"
                e(cmd) : "synth_runner"
         e(properties) : "b"

matrices:
                   e(b) :  1 x 4
          e(pvals_std) :  1 x 4
              e(pvals) :  1 x 4
      e(treat_control) :  14 x 2
```

```
.         matrix p4 = e(pvals)

.
.         // get standard plot of means, as well as gap between TX
.         // and synthetic control
.
.         effect_graphs, treated_name(Syracuse) sc_name(Synthetic Syracuse) ///
>                 tc_gname(syr1) tc_ytitle(K-12 enrollment) ///
>                 tc_options(title("Specification 4 (Full Donor Pool)") ///
>                         xlabel(1998(3)2011) xtitle("") nodraw) ///
>                 effect_gname(syr2)  effect_ytitle(Gap in K-12 enrollment) ///
>                 effect_options(title("Specification 4 (Full Donor Pool)") ///
>                         xlabel(1998(3)2011) xtitle("") nodraw) trlinediff(0)

.
.         graph save syr1 enrollmentspec4, replace
(note: file enrollmentspec4.gph not found)
(file enrollmentspec4.gph saved)

.         graph save syr2 enrollmentspec4gap, replace
(note: file enrollmentspec4gap.gph not found)
(file enrollmentspec4gap.gph saved)

.
.         // plot the gap for TX vs all of the placebos
.
.         single_treatment_graphs, do_color(gs12) treated_name(Syracuse) ///
>                 raw_gname(syr3) raw_options(title("Specification 4 (Full Donor Pool
> )") ///
>                         xlabel(1998(3)2011) xtitle("") nodraw) ///
>                 effects_gname(syr4) effects_options(title("Specification 4 (Full Do
> nor Pool)") ///
>                         xlabel(1998(3)2011) xtitle("") nodraw) ///
>                 trlinediff(0)

.
.         graph save syr3 enrollmentspec4placebo, replace
(note: file enrollmentspec4placebo.gph not found)
(file enrollmentspec4placebo.gph saved)

.         graph save syr4 enrollmentspec4placebogap, replace
(note: file enrollmentspec4placebogap.gph not found)
(file enrollmentspec4placebogap.gph saved)

.
.         // plot pvalue by time period
.
.         pval_graphs, pvals_options(title("Specification 2 (Full Donor Pool): pvalue
> s") xtitle("") nodraw) ///
>                  pvals_std_options(title("Specification 2 (Full Donor Pool): pvalue
> s (std)") xtitle("") nodraw)

.
.         graph save pvals enrollmentspec4pvals, replace
(note: file enrollmentspec4pvals.gph not found)
(file enrollmentspec4pvals.gph saved)

.         graph save pvals_std enrollmentspec4pvalsstd, replace
(note: file enrollmentspec4pvalsstd.gph not found)
(file enrollmentspec4pvalsstd.gph saved)

.
.         // can use RMSPE pre and post (saved to dataset) to calculate test
```

```
.         // stats for each district
.
.         gen teststat = post_rmspe / pre_rmspe

.         summ teststat if id==238 & year==2011

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
    teststat |          1    3.255903           .   3.255903   3.255903

.         local syrt = r(mean)

.         histogram teststat if year==2011, xline(`syrt')
(bin=16, start=.10041211, width=1.4529523)

.         egen teststatrank=rank(teststat),by(year)

.         summ teststatrank if id==238 & year==2011

    Variable |        Obs        Mean    Std. Dev.       Min        Max
-------------+---------------------------------------------------------
teststatrank |          1         202           .        202        202

.         local syrtr = r(mean)

.         // what proportion of districts have a higher test stat?
.         display `syrtr'/276
.73188406

.
.         drop pre_rmspe - no_enroll_k12_synth

.
.
. // ************************************************************************
. // Specification 4 - restricted donor pool
. // ************************************************************************
.
.         preserve

.         keep if target_donor==1
(3,542 observations deleted)

.
.         synth no_enroll_k12 no_enroll_k12(1998(1)2006) no_enroll_k12(2007) ///
>                 p_lunch p_black p_hispanic, fig ///
>                 trunit(238) trperiod(2008) keep(espec4r.dta) replace
-------------------------------------------------------------------------------
Synthetic Control Method for Comparative Case Studies
-------------------------------------------------------------------------------

First Step: Data Setup
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
Data Setup successful
-------------------------------------------------------------------------------
                Treated Unit: Syracuse Cit
              Control Units: Albany City, Amityville U, Brentwood Un, Buffalo City,
                             Central Isli, Dunkirk City, East Ramapo, Hempstead Un,
                             Hudson City, Middletown C, Mount Vernon, Newburgh Cit,
                             Niagara Fall, Poughkeepsie, Rochester Ci, Roosevelt Un,
                             Schenectady, Troy City Sc, Utica City S, Westbury Uni,
                             Wyandanch Un, Yonkers City
-------------------------------------------------------------------------------
          Dependent Variable: no_enroll_k12
  MSPE minimized for periods: 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007
Results obtained for periods: 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008
                             2009 2010 2011
-------------------------------------------------------------------------------
                Predictors: no_enroll_k12(1998(1)2006) no_enroll_k12(2007) p_lunch
                             p_black p_hispanic
-------------------------------------------------------------------------------
Unless period is specified
predictors are averaged over: 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007
-------------------------------------------------------------------------------
```

```
Second Step: Run Optimization
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
Optimization done
--------------------------------------------------------------------------------

Third Step: Obtain Results
--------------------------------------------------------------------------------
Loss: Root Mean Squared Prediction Error

---------------------
   RMSPE |  225.8671
---------------------
--------------------------------------------------------------------------------
Unit Weights:

--------------------------
       Co_No | Unit_Weight
-------------+------------
Albany City  |           0
Amityville U |           0
Brentwood Un |           0
Buffalo City |        .034
Central Isli |           0
Dunkirk City |           0
East Ramapo  |           0
Hempstead Un |           0
Hudson City  |           0
Middletown C |           0
Mount Vernon |           0
Newburgh Cit |           0
Niagara Fall |        .499
Poughkeepsie |           0
Rochester Ci |        .467
Roosevelt Un |           0
Schenectady  |           0
Troy City Sc |           0
Utica City S |           0
Westbury Uni |           0
Wyandanch Un |           0
Yonkers City |           0
--------------------------
--------------------------------------------------------------------------------
Predictor Balance:

----------------------------------------------------
                              |   Treated  Synthetic
------------------------------+---------------------
    no_enroll_k12(1998(1)2006) |  21761.33   21770.31
           no_enroll_k12(2007) |     19759   19764.63
                       p_lunch |  .6088626   .5510698
                       p_black |  .4749719   .4814306
                    p_hispanic |  .0775515   .1036509
----------------------------------------------------
--------------------------------------------------------------------------------

.
.         graph save Graph enrollmentspec4ra, replace
(note: file enrollmentspec4ra.gph not found)
(file enrollmentspec4ra.gph saved)

.
```

```
.         synth_runner no_enroll_k12 no_enroll_k12(1998(1)2006) no_enroll_k12(2007)
> ///
>                 p_lunch p_black p_hispanic, ///
>                 trunit(238) trperiod(2008) gen_vars keep(espec4rb.dta) replace
Estimating the treatment effects
Estimating the possible placebo effects (one set for each of the 1 treatment periods)
|                    | Total: 22
.....................| 3.00s elapsed.

Conducting inference: 5 steps, and 22 placebo averages
Step 1... Finished
Step 2... Finished
Step 3... Finished
Step 4... Finished
Step 5... Finished

Post-treatment results: Effects, p-values, standardized p-values

             | estimates      pvals  pvals_std
-------------+---------------------------------
          c1 |    63.504   .7272727   .8181818
          c2 |   730.335   .0909091   .1363636
          c3 |   838.543   .0909091   .1363636
          c4 |  1165.418   .0909091   .0454545


.
.         // see saved statistics, save pvals to a matrix
.
.         ereturn list

scalars:
               e(n_pl) =  22
          e(n_pl_used) =  22
    e(pval_joint_post) =  .0909090909090909
  e(pval_joint_post_s
    td)              =  .0909090909090909
    e(avg_pre_rmspe_p) =  .4090909090909091

macros:
           e(trperiod) : "2008"
             e(trunit) : "238"
         e(treat_type) : "single unit"
             e(depvar) : "no_enroll_k12"
                e(cmd) : "synth_runner"
         e(properties) : "b"

matrices:
                  e(b) :  1 x 4
          e(pvals_std) :  1 x 4
              e(pvals) :  1 x 4
      e(treat_control) :  14 x 2

.         matrix p4r = e(pvals)

.
.         // get standard plot of means, as well as gap between TX
.         // and synthetic control
.
.         effect_graphs, treated_name(Syracuse) sc_name(Synthetic Syracuse) ///
>                 tc_gname(syr1) tc_ytitle(K-12 enrollment) ///
>                 tc_options(title("Specification 4 (Restricted Donor Pool)") ///
>                         xlabel(1998(3)2011) xtitle("") nodraw) ///
>                 effect_gname(syr2)  effect_ytitle(Gap in K-12 enrollment) ///
>                 effect_options(title("Specification 4 (Restricted Donor Pool)") ///
>                         xlabel(1998(3)2011) xtitle("") nodraw) trlinediff(0)
```

```
.
.         graph save syr1 enrollmentspec4r, replace
(note: file enrollmentspec4r.gph not found)
(file enrollmentspec4r.gph saved)

.         graph save syr2 enrollmentspec4rgap, replace
(note: file enrollmentspec4rgap.gph not found)
(file enrollmentspec4rgap.gph saved)

.
.         // plot the gap for TX vs all of the placebos
.
.         single_treatment_graphs, do_color(gs12) treated_name(Syracuse) ///
>                 raw_gname(syr3) raw_options(title("Specification 4 (Restricted Dono
> r Pool)") ///
>                         xlabel(1998(3)2011) xtitle("") nodraw) ///
>                 effects_gname(syr4) effects_options(title("Specification 4 (Restric
> ted Donor Pool)") ///
>                         xlabel(1998(3)2011) xtitle("") nodraw) ///
>                 trlinediff(0)

.
.         graph save syr3 enrollmentspec4rplacebo, replace
(note: file enrollmentspec4rplacebo.gph not found)
(file enrollmentspec4rplacebo.gph saved)

.         graph save syr4 enrollmentspec4rplacebogap, replace
(note: file enrollmentspec4rplacebogap.gph not found)
(file enrollmentspec4rplacebogap.gph saved)

.
.         // plot pvalue by time period
.
.         pval_graphs, pvals_options(title("Specification 4 (Restricted Donor Pool):
> pvalues") xtitle("") nodraw) ///
>                  pvals_std_options(title("Specification 4 (Restricted Donor Pool):
> pvalues (std)") xtitle("") nodraw)

.
.         graph save pvals enrollmentspec4rpvals, replace
(note: file enrollmentspec4rpvals.gph not found)
(file enrollmentspec4rpvals.gph saved)

.         graph save pvals_std enrollmentspec4rpvalsstd, replace
(note: file enrollmentspec4rpvalsstd.gph not found)
(file enrollmentspec4rpvalsstd.gph saved)

.
.         drop pre_rmspe - no_enroll_k12_synth

.         restore

.
.         capture graph close _all

.         matrix dir
          p4r[1,4]
           p4[1,4]
          p2r[1,4]
           p2[1,4]

.
.
```

```
. // ***************************************************************************
. // Graduation data
. // ***************************************************************************
.
. // *****************
. // Setup
. // *****************
.
.         use https://github.com/spcorcor18/LPO-8852/raw/main/data/nys_data_grad.dta,
>  clear

.
.         // There are 237 school districts x 10 years = 2370 observations
.         // Syracuse is id==205
.
.         table year

----------------------
year      |
(2001-201 |
0)        |      Freq.
----------+-----------
     2001 |        237
     2002 |        237
     2003 |        237
     2004 |        237
     2005 |        237
     2006 |        237
     2007 |        237
     2008 |        237
     2009 |        237
     2010 |        237
----------------------

.         unique district
Number of unique values of district_name is  237
Number of records is  2370

.         unique id
Number of unique values of id is  237
Number of records is  2370

.         tabulate id if substr(district,1,4)=="SYRA"

group(distr |
  ict_name) |      Freq.     Percent        Cum.
------------+-----------------------------------
        205 |         10      100.00      100.00
------------+-----------------------------------
      Total |         10      100.00

.
.         // District name is too long for use with synth command; try creating a
.         // truncated version. Also make sure it doesn't vary over time within id.
.
.         by id: gen temp=district_name if _n==1
(2,133 missing values generated)

.         egen district_name2=mode(temp), by(id)

.
.         gen district2=proper(substr(district_name2,1,12))
```

```
.         labmask id, values(district2)

.         drop temp district_name2

.
.         xtset id year
       panel variable:  id (strongly balanced)
        time variable:  year, 2001 to 2010
                delta:  1 unit

.
.         // ulocal07 codes 11, 12, and 13 are large, midsize, and small cities
.
.         tabulate ulocal07

 local type |
    code (7 |
categories) |
  - numeric |      Freq.     Percent        Cum.
------------+-----------------------------------
         11 |         10        0.42        0.42
         12 |         20        0.84        1.27
         13 |        190        8.02        9.28
         21 |      1,910       80.59       89.87
         22 |        120        5.06       94.94
         23 |        100        4.22       99.16
         32 |         20        0.84      100.00
------------+-----------------------------------
      Total |      2,370      100.00

.         tabulate local07

   locale type |
       code (7 |
 categories) - |
       string |      Freq.     Percent        Cum.
--------------+-----------------------------------
    City-Large |         10        0.42        0.42
  City-Midsize |         20        0.84        1.27
    City-Small |        190        8.02        9.28
  Suburb-Large |      1,910       80.59       89.87
Suburb-Midsize |        120        5.06       94.94
  Suburb-Small |        100        4.22       99.16
  Town-Distant |         20        0.84      100.00
---------------+-----------------------------------
         Total |      2,370      100.00

.
.         // Note: use the dataset's target_donor flag (see earlier note)
.
.         tabulate year target_donor

      year |
(2001-2010 |     target_donor
         ) |         0          1 |     Total
-----------+----------------------+----------
      2001 |       214         23 |       237
      2002 |       214         23 |       237
      2003 |       214         23 |       237
      2004 |       214         23 |       237
      2005 |       214         23 |       237
      2006 |       214         23 |       237
      2007 |       214         23 |       237
      2008 |       214         23 |       237
      2009 |       214         23 |       237
      2010 |       214         23 |       237
-----------+----------------------+----------
     Total |     2,140        230 |     2,370
```

```
.
.
. // ******************************************************
. // synth (for weights) and synth_runner (everything else)
. // ******************************************************
.
. // ************************************************************************
. // Specification 2 - full donor pool
. // ************************************************************************
.
.         synth grad grad(2001) grad(2004) ///
>                 grad(2007) p_lunch p_black p_hispanic, fig ///
>                 trunit(205) trperiod(2008) keep(gspec2.dta) replace
-------------------------------------------------------------------------------
Synthetic Control Method for Comparative Case Studies
-------------------------------------------------------------------------------

First Step: Data Setup
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
Data Setup successful
-------------------------------------------------------------------------------
               Treated Unit: Syracuse Cit
             Control Units: Albany City, Alden Centra, Amherst Cent, Amityville U,
                            Ardsley Unio, Babylon Unio, Baldwin Unio, Baldwinsvill,
                            Ballston Spa, Bay Shore Un, Bayport-Blue, Beacon City,
                            Bellmore-Mer, Bethlehem Ce, Bethpage Uni, Binghamton C,
                            Blind Brook-, Brentwood Un, Briarcliff M, Brighton Cen,
                            Brockport Ce, Bronxville U, Brookhaven-C, Buffalo City,
                            Burnt Hills-, Byram Hills, Carle Place, Center Moric,
                            Central Isli, Chappaqua Ce, Cheektowaga, Cheektowaga-,
                            Cheektowaga-, Chenango For, Chenango Val, Clarkstown C,
                            Cleveland Hi, Clinton Cent, Cohoes City, Cold Spring,
                            Commack Unio, Connetquot C, Copiague Uni, Cornwall Cen,
                            Croton-Harmo, Deer Park Un, Depew Union, Dobbs Ferry,
                            Dunkirk City, East Aurora, East Irondeq, East Meadow,
                            East Ramapo, East Rochest, East Rockawa, Eastchester,
                            Eden Central, Edgemont Uni, Elmira City, Elmira Heigh,
                            Elwood Union, Fairport Cen, Farmingdale, Fayetteville,
                            Fort Edward, Freeport Uni, Frontier Cen, Garden City,
                            Gates-Chili, Glen Cove Ci, Glens Falls, Grand Island,
                            Great Neck U, Greece Centr, Green Island, Greenburgh C,
                            Greenburgh E, Guilderland, Half Hollow, Hamburg Cent,
                            Hampton Bays, Harborfields, Harrison Cen, Hastings-On-,
                            Hauppauge Un, Haverstraw-S, Hawthorne-Ce, Hempstead Un,
                            Hendrick Hud, Herricks Uni, Hicksville U, Highland Cen,
                            Highland Fal, Hilton Centr, Horseheads C, Hudson City,
                            Hudson Falls, Huntington U, Hyde Park Ce, Irvington Un,
                            Island Trees, Islip Union, Ithaca City, Jamesville-D,
                            Jericho Unio, Johnson City, Katonah-Lewi, Kenmore-Tona,
                            Kings Park C, Kingston Cit, Lackawanna C, Lakeland Cen,
                            Lancaster Ce, Lansingburgh, Lawrence Uni, Levittown Un,
                            Lindenhurst, Liverpool Ce, Locust Valle, Long Beach C,
                            Longwood Cen, Lynbrook Uni, Mahopac Cent, Maine-Endwel,
                            Malverne Uni, Mamaroneck U, Manhasset Un, Marcellus Ce,
                            Marlboro Cen, Massapequa U, Middle Count, Middletown C,
                            Miller Place, Mineola Unio, Mount Pleasa, Mount Sinai,
                            Mount Vernon, Nanuet Union, New Hartford, New Rochelle,
                            New York Mil, Newburgh Cit, Niagara Fall, Niskayuna Ce,
                            North Babylo, North Shore, North Syracu, North Tonawa,
                            Northport-Ea, Nyack Union, Oceanside Un, Orchard Park,
                            Oriskany Cen, Ossining Uni, Oyster Bay-E, Patchogue-Me,
                            Pearl River, Pelham Union, Penfield Cen, Phoenix Cent,
                            Pittsford Ce, Plainedge Un, Plainview-Ol, Pleasantvill,
                            Port Chester, Port Jeffers, Port Washing, Poughkeepsie,
                            Queensbury U, Ramapo Centr, Rensselaer C, Rochester Ci,
                            Rockville Ce, Rocky Point, Roosevelt Un, Roslyn Union,
                            Rotterdam-Mo, Rush-Henriet, Rye City Sch, Rye Neck Uni,
                            Sachem Centr, Saratoga Spr, Saugerties C, Sayville Uni,
                            Scarsdale Un, Schenectady, Scotia-Glenv, Seaford Unio,
                            Sewanhaka Ce, Shenendehowa, Shoreham-Wad, Smithtown Ce,
                            Solvay Union, Somers Centr, South Coloni, South Countr,
                            South Glens, South Huntin, South Orange, Spackenkill,
                            Spencerport, Susquehanna, Sweet Home C, Syosset Cent,
                            Three Villag, Tonawanda Ci, Troy City Sc, Tuckahoe Uni,
```

```
                            Union Free S, Union-Endico, Utica City S, Valhalla Uni,
                            Valley Strea, Vestal Centr, Victor Centr, Wallkill Cen,
                            Wantagh Unio, Wappingers C, Washingtonvi, Watervliet C,
                            Webster Cent, West Babylon, West Genesee, West Hempste,
                            West Irondeq, West Islip U, West Seneca, Westbury Uni,
                            Westhampton, Westhill Cen, White Plains, Whitesboro C,
                            William Floy, Williamsvill, Wyandanch Un, Yonkers City
--------------------------------------------------------------------------------
          Dependent Variable: grad
  MSPE minimized for periods: 2001 2002 2003 2004 2005 2006 2007
Results obtained for periods: 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
--------------------------------------------------------------------------------
                  Predictors: grad(2001) grad(2004) grad(2007) p_lunch p_black
                              p_hispanic
--------------------------------------------------------------------------------
Unless period is specified
predictors are averaged over: 2001 2002 2003 2004 2005 2006 2007
--------------------------------------------------------------------------------

Second Step: Run Optimization
--------------------------------------------------------------------------------
--------------------------------------------------------------------------------
Optimization done
--------------------------------------------------------------------------------

Third Step: Obtain Results
--------------------------------------------------------------------------------
Loss: Root Mean Squared Prediction Error

----------------------
   RMSPE |  2.840577
----------------------
--------------------------------------------------------------------------------
Unit Weights:

---------------------------
       Co_No | Unit_Weight
-------------+-------------
Albany City  |           0
Alden Centra |           0
Amherst Cent |           0
Amityville U |           0
Ardsley Unio |           0
Babylon Unio |           0
Baldwin Unio |           0
Baldwinsvill |           0
Ballston Spa |           0
Bay Shore Un |           0
Bayport-Blue |           0
Beacon City  |           0
Bellmore-Mer |           0
Bethlehem Ce |           0
Bethpage Uni |           0
Binghamton C |           0
Blind Brook- |           0
Brentwood Un |           0
Briarcliff M |           0
Brighton Cen |           0
Brockport Ce |           0
Bronxville U |           0
Brookhaven-C |           0
Buffalo City |        .477
Burnt Hills- |           0
Byram Hills  |           0
Carle Place  |           0
Center Moric |           0
Central Isli |           0
Chappaqua Ce |           0
Cheektowaga  |           0
Cheektowaga- |           0
Cheektowaga- |           0
Chenango For |           0
Chenango Val |           0
Clarkstown C |           0
Cleveland Hi |           0
```

Clinton Cent	0
Cohoes City	0
Cold Spring	0
Commack Unio	0
Connetquot C	0
Copiague Uni	0
Cornwall Cen	0
Croton-Harmo	0
Deer Park Un	0
Depew Union	0
Dobbs Ferry	0
Dunkirk City	0
East Aurora	0
East Irondeq	0
East Meadow	0
East Ramapo	0
East Rochest	0
East Rockawa	0
Eastchester	0
Eden Central	0
Edgemont Uni	0
Elmira City	0
Elmira Heigh	0
Elwood Union	0
Fairport Cen	0
Farmingdale	0
Fayetteville	0
Fort Edward	0
Freeport Uni	0
Frontier Cen	0
Garden City	0
Gates-Chili	0
Glen Cove Ci	0
Glens Falls	0
Grand Island	0
Great Neck U	0
Greece Centr	0
Green Island	0
Greenburgh C	0
Greenburgh E	.166
Guilderland	0
Half Hollow	0
Hamburg Cent	0
Hampton Bays	0
Harborfields	0
Harrison Cen	0
Hastings-On-	0
Hauppauge Un	0
Haverstraw-S	0
Hawthorne-Ce	0
Hempstead Un	0
Hendrick Hud	0
Herricks Uni	0
Hicksville U	0
Highland Cen	0
Highland Fal	0
Hilton Centr	0
Horseheads C	0
Hudson City	0
Hudson Falls	0
Huntington U	0
Hyde Park Ce	0
Irvington Un	0
Island Trees	0
Islip Union	0
Ithaca City	0
Jamesville-D	0
Jericho Unio	0
Johnson City	0
Katonah-Lewi	0
Kenmore-Tona	0
Kings Park C	0
Kingston Cit	0
Lackawanna C	0
Lakeland Cen	0

Lancaster Ce	0
Lansingburgh	0
Lawrence Uni	0
Levittown Un	0
Lindenhurst	0
Liverpool Ce	0
Locust Valle	0
Long Beach C	0
Longwood Cen	0
Lynbrook Uni	0
Mahopac Cent	0
Maine-Endwel	0
Malverne Uni	0
Mamaroneck U	0
Manhasset Un	0
Marcellus Ce	0
Marlboro Cen	0
Massapequa U	0
Middle Count	0
Middletown C	0
Miller Place	0
Mineola Unio	0
Mount Pleasa	0
Mount Sinai	0
Mount Vernon	0
Nanuet Union	0
New Hartford	0
New Rochelle	0
New York Mil	0
Newburgh Cit	0
Niagara Fall	.168
Niskayuna Ce	0
North Babylo	0
North Shore	0
North Syracu	0
North Tonawa	0
Northport-Ea	0
Nyack Union	0
Oceanside Un	0
Orchard Park	0
Oriskany Cen	0
Ossining Uni	0
Oyster Bay-E	0
Patchogue-Me	0
Pearl River	0
Pelham Union	0
Penfield Cen	0
Phoenix Cent	0
Pittsford Ce	0
Plainedge Un	0
Plainview-Ol	0
Pleasantvill	0
Port Chester	0
Port Jeffers	0
Port Washing	0
Poughkeepsie	0
Queensbury U	0
Ramapo Centr	0
Rensselaer C	.189
Rochester Ci	0
Rockville Ce	0
Rocky Point	0
Roosevelt Un	0
Roslyn Union	0
Rotterdam-Mo	0
Rush-Henriet	0
Rye City Sch	0
Rye Neck Uni	0
Sachem Centr	0
Saratoga Spr	0
Saugerties C	0
Sayville Uni	0
Scarsdale Un	0
Schenectady	0
Scotia-Glenv	0

```
Seaford Unio |           0
Sewanhaka Ce |           0
Shenendehowa |           0
Shoreham-Wad |           0
Smithtown Ce |           0
Solvay Union |           0
Somers Centr |           0
South Coloni |           0
South Countr |           0
South Glens  |           0
South Huntin |           0
South Orange |           0
Spackenkill  |           0
Spencerport  |           0
Susquehanna  |           0
Sweet Home C |           0
Syosset Cent |           0
Three Villag |           0
Tonawanda Ci |           0
Troy City Sc |           0
Tuckahoe Uni |           0
Union Free S |           0
Union-Endico |           0
Utica City S |           0
Valhalla Uni |           0
Valley Strea |           0
Vestal Centr |           0
Victor Centr |           0
Wallkill Cen |           0
Wantagh Unio |           0
Wappingers C |           0
Washingtonvi |           0
Watervliet C |           0
Webster Cent |           0
West Babylon |           0
West Genesee |           0
West Hempste |           0
West Irondeq |           0
West Islip U |           0
West Seneca  |           0
Westbury Uni |           0
Westhampton  |           0
Westhill Cen |           0
White Plains |           0
Whitesboro C |           0
William Floy |           0
Williamsvill |           0
Wyandanch Un |           0
Yonkers City |           0
-------------------------
```

Predictor Balance:

	Treated	Synthetic
grad(2001)	58	58.045
grad(2004)	65	64.902
grad(2007)	52.19123	52.22902
p_lunch	.6195215	.59751
p_black	.4892273	.4511101
p_hispanic	.086742	.118369

```
.
.         graph save Graph gradspec2a, replace
(note: file gradspec2a.gph not found)
(file gradspec2a.gph saved)

.
.         synth_runner grad grad(2001) grad(2004) ///
>                 grad(2007) p_lunch p_black p_hispanic, ///
>                 trunit(205) trperiod(2008) gen_vars keep(gspec2b.dta) replace
Estimating the treatment effects
Estimating the possible placebo effects (one set for each of the 1 treatment periods)
----+--- 1 ---+--- 2 ---+--- 3 ---+--- 4 ---+--- 5 Total: 236
.................................................. 83.00s elapsed. 5.13m remaining
.................................................. 2.78m elapsed. 3.78m remaining
.................................................. 4.13m elapsed. 2.37m remaining
.................................................. 5.52m elapsed. 60.00s remaining
..................................|  6.52m elapsed.

Conducting inference: 5 steps, and 236 placebo averages
Step 1... Finished
Step 2... Finished
Step 3... Finished
Step 4... Finished
Step 5... Finished

Post-treatment results: Effects, p-values, standardized p-values

             | estimates      pvals  pvals_std
-------------+----------------------------------
          c1 | -13.27367   .0127119   .0254237
          c2 | -6.285863   .0889831   .1525424
          c3 |  .3669198   .9025424   .9364407

.
.         // see saved statistics, save pvals to a matrix
.
.         ereturn list

scalars:
               e(n_pl) =  236
          e(n_pl_used) =  236
    e(pval_joint_post) =  .0508474576271186
  e(pval_joint_post_s
    td)                =  .0889830508474576
    e(avg_pre_rmspe_p) =  .3686440677966102

macros:
           e(trperiod) : "2008"
             e(trunit) : "205"
         e(treat_type) : "single unit"
             e(depvar) : "grad"
                e(cmd) : "synth_runner"
         e(properties) : "b"

matrices:
                   e(b) :  1 x 3
          e(pvals_std) :  1 x 3
              e(pvals) :  1 x 3
      e(treat_control) :  10 x 2

.         matrix p2 = e(pvals)

.
```

```
.         // get standard plot of means, as well as gap between TX and synthetic cont
> rol
.
.         effect_graphs, treated_name(Syracuse) sc_name(Synthetic Syracuse) ///
>                 tc_gname(syr1) tc_ytitle(Graduation Rate) ///
>                 tc_options(title("Specification 2 (Full Donor Pool)") ///
>                         xlabel(2001(2)2010) xtitle("") nodraw) ///
>                 effect_gname(syr2)  effect_ytitle(Gap in Graduation Rate) ///
>                 effect_options(title("Specification 2 (Full Donor Pool)") ///
>                         xlabel(2001(2)2010) xtitle("") nodraw) trlinediff(0)

.
.         graph save syr1 gradspec2, replace
(note: file gradspec2.gph not found)
(file gradspec2.gph saved)

.         graph save syr2 gradspec2gap, replace
(note: file gradspec2gap.gph not found)
(file gradspec2gap.gph saved)

.
.         // plot the gap for TX vs all of the placebos
.
.         single_treatment_graphs, do_color(gs12) treated_name(Syracuse) ///
>                 raw_gname(syr3) raw_options(title("Specification 2 (Full Donor Pool
> )") ///
>                         xlabel(2001(2)2010) xtitle("") nodraw) ///
>                 effects_gname(syr4) effects_options(title("Specification 2 (Full Do
> nor Pool)") ///
>                         xlabel(2001(2)2010) xtitle("") nodraw) trlinediff(0)

.
.         graph save syr3 gradspec2placebo, replace
(note: file gradspec2placebo.gph not found)
(file gradspec2placebo.gph saved)

.         graph save syr4 gradspec2placebogap, replace
(note: file gradspec2placebogap.gph not found)
(file gradspec2placebogap.gph saved)

.
.         // plot pvalue by time period
.
.         pval_graphs, pvals_options(title("Specification 2 (Full Donor Pool): pvalue
> s") xtitle("") nodraw) ///
>                  pvals_std_options(title("Specification 2 (Full Donor Pool): pvalue
> s (std)") xtitle("") nodraw)

.
.         graph save pvals gradspec2pvals, replace
(note: file gradspec2pvals.gph not found)
(file gradspec2pvals.gph saved)

.         graph save pvals_std gradspec2pvalsstd, replace
(note: file gradspec2pvalsstd.gph not found)
(file gradspec2pvalsstd.gph saved)

.
.         drop pre_rmspe - grad_synth

.
.
. // ***************************************************************************
```

```
. // Specification 2 - restricted donor pool
. // ************************************************************************
.
.         preserve

.         keep if target_donor==1
(2,140 observations deleted)

.
.         synth grad grad(2001) grad(2004) grad(2007) ///
>                 p_lunch p_black p_hispanic, fig trunit(205) trperiod(2008) ///
>                 keep(gspec2r.dta) replace
-------------------------------------------------------------------------------
Synthetic Control Method for Comparative Case Studies
-------------------------------------------------------------------------------

First Step: Data Setup
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
Data Setup successful
-------------------------------------------------------------------------------
                Treated Unit: Syracuse Cit
               Control Units: Albany City, Amityville U, Brentwood Un, Buffalo City,
                              Central Isli, Dunkirk City, East Ramapo, Hempstead Un,
                              Hudson City, Middletown C, Mount Vernon, Newburgh Cit,
                              Niagara Fall, Poughkeepsie, Rochester Ci, Roosevelt Un,
                              Schenectady, Troy City Sc, Utica City S, Westbury Uni,
                              Wyandanch Un, Yonkers City
-------------------------------------------------------------------------------
          Dependent Variable: grad
  MSPE minimized for periods: 2001 2002 2003 2004 2005 2006 2007
Results obtained for periods: 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
-------------------------------------------------------------------------------
                 Predictors: grad(2001) grad(2004) grad(2007) p_lunch p_black
                              p_hispanic
-------------------------------------------------------------------------------
Unless period is specified
predictors are averaged over: 2001 2002 2003 2004 2005 2006 2007
-------------------------------------------------------------------------------

Second Step: Run Optimization
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
Optimization done
-------------------------------------------------------------------------------

Third Step: Obtain Results
-------------------------------------------------------------------------------
Loss: Root Mean Squared Prediction Error

---------------------
   RMSPE |  2.791981
---------------------
-------------------------------------------------------------------------------
Unit Weights:

--------------------------
       Co_No | Unit_Weight
-------------+------------
Albany City  |           0
Amityville U |           0
Brentwood Un |           0
Buffalo City |        .789
Central Isli |           0
Dunkirk City |           0
East Ramapo  |           0
Hempstead Un |        .036
Hudson City  |           0
Middletown C |           0
Mount Vernon |           0
Newburgh Cit |           0
Niagara Fall |         .09
Poughkeepsie |           0
Rochester Ci |           0
Roosevelt Un |           0
```

```
Schenectady  |        .085
Troy City Sc |          0
Utica City S |          0
Westbury Uni |          0
Wyandanch Un |          0
Yonkers City |          0
-------------------------
------------------------------------------------------------------------------------------
Predictor Balance:

-----------------------------------------------------
                              |   Treated  Synthetic
------------------------------+----------------------
                    grad(2001) |        58     60.328
                    grad(2004) |        65     62.464
                    grad(2007) |  52.19123   54.02139
                       p_lunch |  .6195215   .6334638
                       p_black |  .4892273   .5095109
                    p_hispanic |   .086742   .1295687
-----------------------------------------------------
------------------------------------------------------------------------------------------

.
.         graph save Graph gradspec2ra, replace
(note: file gradspec2ra.gph not found)
(file gradspec2ra.gph saved)

.
.         synth_runner grad grad(2001) grad(2004) grad(2007) ///
>                 p_lunch p_black p_hispanic, trunit(205) trperiod(2008) ///
>                 gen_vars keep(gspec2rb.dta) replace
Estimating the treatment effects
Estimating the possible placebo effects (one set for each of the 1 treatment periods)
|                    | Total: 22
.....................| 3.00s elapsed.

Conducting inference: 5 steps, and 22 placebo averages
Step 1... Finished
Step 2... Finished
Step 3... Finished
Step 4... Finished
Step 5... Finished

Post-treatment results: Effects, p-values, standardized p-values

             | estimates      pvals  pvals_std
-------------+----------------------------------
          c1 |  -9.38213   .1818182          0
          c2 | -1.601879   .9545455   .8181818
          c3 | -2.794046   .6818182         .5

.
.         // see saved statistics, save pvals to a matrix
.
.         ereturn list

scalars:
               e(n_pl) =  22
          e(n_pl_used) =  22
    e(pval_joint_post) =  .5454545454545454
  e(pval_joint_post_s
    td)                =  .3181818181818182
    e(avg_pre_rmspe_p) =  .7727272727272727

macros:
            e(trperiod) : "2008"
              e(trunit) : "205"
         e(treat_type) : "single unit"
              e(depvar) : "grad"
                 e(cmd) : "synth_runner"
         e(properties) : "b"
```

```
matrices:
                  e(b) :  1 x 3
          e(pvals_std) :  1 x 3
              e(pvals) :  1 x 3
      e(treat_control) :  10 x 2

.         matrix p2r = e(pvals)

.
.         // get standard plot of means, as well as gap between TX
.         // and synthetic control
.
.         effect_graphs, treated_name(Syracuse) sc_name(Synthetic Syracuse) ///
>                 tc_gname(syr1) tc_ytitle(Graduation Rate) ///
>                 tc_options(title("Specification 2 (Restricted Donor Pool)") ///
>                         xlabel(2001(2)2010) xtitle("") nodraw) ///
>                 effect_gname(syr2)  effect_ytitle(Gap in Graduation Rate) ///
>                 effect_options(title("Specification 2 (Restricted Donor Pool)") ///
>                         xlabel(2001(2)2010) xtitle("") nodraw) trlinediff(0)

.
.         graph save syr1 gradspec2r, replace
(note: file gradspec2r.gph not found)
(file gradspec2r.gph saved)

.         graph save syr2 gradspec2rgap, replace
(note: file gradspec2rgap.gph not found)
(file gradspec2rgap.gph saved)

.
.         // plot the gap for TX vs all of the placebos
.
.         single_treatment_graphs, do_color(gs12) treated_name(Syracuse) ///
>                 raw_gname(syr3) raw_options(title("Specification 2 (Restricted Dono
> r Pool)") ///
>                         xlabel(2001(2)2010) xtitle("") nodraw) ///
>                 effects_gname(syr4) effects_options(title("Specification 2 (Restric
> ted Donor Pool)") ///
>                         xlabel(2001(2)2010) xtitle("") nodraw) trlinediff(0)

.
.         graph save syr3 gradspec2rplacebo, replace
(note: file gradspec2rplacebo.gph not found)
(file gradspec2rplacebo.gph saved)

.         graph save syr4 gradspec2rplacebogap, replace
(note: file gradspec2rplacebogap.gph not found)
(file gradspec2rplacebogap.gph saved)

.
.         // plot pvalue by time period
.
.         pval_graphs, pvals_options(title("Specification 2 (Restricted Donor Pool):
> pvalues") xtitle("") nodraw) ///
>                  pvals_std_options(title("Specification 2 (Restricted Donor Pool):
> pvalues (std)") xtitle("") nodraw)

.
.         graph save pvals gradspec2rpvals, replace
(note: file gradspec2rpvals.gph not found)
(file gradspec2rpvals.gph saved)

.         graph save pvals_std gradspec2rpvalsstd, replace
(note: file gradspec2rpvalsstd.gph not found)
(file gradspec2rpvalsstd.gph saved)
```

```
.
.         drop pre_rmspe - grad_synth

.         restore

.
.
. // ***********************************************************************
. // Specification 4 - full donor pool
. // ***********************************************************************
.
.         synth grad grad(2001(1)2006) grad(2007) ///
>                 p_lunch p_black p_hispanic, fig ///
>                 trunit(205) trperiod(2008) keep(gspec4.dta) replace
-------------------------------------------------------------------------------
Synthetic Control Method for Comparative Case Studies
-------------------------------------------------------------------------------

First Step: Data Setup
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
Data Setup successful
-------------------------------------------------------------------------------
               Treated Unit: Syracuse Cit
             Control Units: Albany City, Alden Centra, Amherst Cent, Amityville U,
                            Ardsley Unio, Babylon Unio, Baldwin Unio, Baldwinsvill,
                            Ballston Spa, Bay Shore Un, Bayport-Blue, Beacon City,
                            Bellmore-Mer, Bethlehem Ce, Bethpage Uni, Binghamton C,
                            Blind Brook-, Brentwood Un, Briarcliff M, Brighton Cen,
                            Brockport Ce, Bronxville U, Brookhaven-C, Buffalo City,
                            Burnt Hills-, Byram Hills, Carle Place, Center Moric,
                            Central Isli, Chappaqua Ce, Cheektowaga, Cheektowaga-,
                            Cheektowaga-, Chenango For, Chenango Val, Clarkstown C,
                            Cleveland Hi, Clinton Cent, Cohoes City, Cold Spring,
                            Commack Unio, Connetquot C, Copiague Uni, Cornwall Cen,
                            Croton-Harmo, Deer Park Un, Depew Union, Dobbs Ferry,
                            Dunkirk City, East Aurora, East Irondeq, East Meadow,
                            East Ramapo, East Rochest, East Rockawa, Eastchester,
                            Eden Central, Edgemont Uni, Elmira City, Elmira Heigh,
                            Elwood Union, Fairport Cen, Farmingdale, Fayetteville,
                            Fort Edward, Freeport Uni, Frontier Cen, Garden City,
                            Gates-Chili, Glen Cove Ci, Glens Falls, Grand Island,
                            Great Neck U, Greece Centr, Green Island, Greenburgh C,
                            Greenburgh E, Guilderland, Half Hollow, Hamburg Cent,
                            Hampton Bays, Harborfields, Harrison Cen, Hastings-On-,
                            Hauppauge Un, Haverstraw-S, Hawthorne-Ce, Hempstead Un,
                            Hendrick Hud, Herricks Uni, Hicksville U, Highland Cen,
                            Highland Fal, Hilton Centr, Horseheads C, Hudson City,
                            Hudson Falls, Huntington U, Hyde Park Ce, Irvington Un,
                            Island Trees, Islip Union, Ithaca City, Jamesville-D,
                            Jericho Unio, Johnson City, Katonah-Lewi, Kenmore-Tona,
                            Kings Park C, Kingston Cit, Lackawanna C, Lakeland Cen,
                            Lancaster Ce, Lansingburgh, Lawrence Uni, Levittown Un,
                            Lindenhurst, Liverpool Ce, Locust Valle, Long Beach C,
                            Longwood Cen, Lynbrook Uni, Mahopac Cent, Maine-Endwel,
                            Malverne Uni, Mamaroneck U, Manhasset Un, Marcellus Ce,
                            Marlboro Cen, Massapequa U, Middle Count, Middletown C,
                            Miller Place, Mineola Unio, Mount Pleasa, Mount Sinai,
                            Mount Vernon, Nanuet Union, New Hartford, New Rochelle,
                            New York Mil, Newburgh Cit, Niagara Fall, Niskayuna Ce,
                            North Babylo, North Shore, North Syracu, North Tonawa,
                            Northport-Ea, Nyack Union, Oceanside Un, Orchard Park,
                            Oriskany Cen, Ossining Uni, Oyster Bay-E, Patchogue-Me,
                            Pearl River, Pelham Union, Penfield Cen, Phoenix Cent,
                            Pittsford Ce, Plainedge Un, Plainview-Ol, Pleasantvill,
                            Port Chester, Port Jeffers, Port Washing, Poughkeepsie,
                            Queensbury U, Ramapo Centr, Rensselaer C, Rochester Ci,
                            Rockville Ce, Rocky Point, Roosevelt Un, Roslyn Union,
                            Rotterdam-Mo, Rush-Henriet, Rye City Sch, Rye Neck Uni,
                            Sachem Centr, Saratoga Spr, Saugerties C, Sayville Uni,
                            Scarsdale Un, Schenectady, Scotia-Glenv, Seaford Unio,
                            Sewanhaka Ce, Shenendehowa, Shoreham-Wad, Smithtown Ce,
                            Solvay Union, Somers Centr, South Coloni, South Countr,
                            South Glens, South Huntin, South Orange, Spackenkill,
                            Spencerport, Susquehanna, Sweet Home C, Syosset Cent,
```

```
                              Three Villag, Tonawanda Ci, Troy City Sc, Tuckahoe Uni,
                              Union Free S, Union-Endico, Utica City S, Valhalla Uni,
                              Valley Strea, Vestal Centr, Victor Centr, Wallkill Cen,
                              Wantagh Unio, Wappingers C, Washingtonvi, Watervliet C,
                              Webster Cent, West Babylon, West Genesee, West Hempste,
                              West Irondeq, West Islip U, West Seneca, Westbury Uni,
                              Westhampton, Westhill Cen, White Plains, Whitesboro C,
                              William Floy, Williamsvill, Wyandanch Un, Yonkers City
-------------------------------------------------------------------------------------
          Dependent Variable: grad
  MSPE minimized for periods: 2001 2002 2003 2004 2005 2006 2007
Results obtained for periods: 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
-------------------------------------------------------------------------------------
                  Predictors: grad(2001(1)2006) grad(2007) p_lunch p_black p_hispanic
-------------------------------------------------------------------------------------
Unless period is specified
predictors are averaged over: 2001 2002 2003 2004 2005 2006 2007
-------------------------------------------------------------------------------------

Second Step: Run Optimization
-------------------------------------------------------------------------------------
-------------------------------------------------------------------------------------
Optimization done
-------------------------------------------------------------------------------------

Third Step: Obtain Results
-------------------------------------------------------------------------------------
Loss: Root Mean Squared Prediction Error

----------------------
   RMSPE |  2.654231
----------------------
-------------------------------------------------------------------------------------
Unit Weights:

---------------------------
       Co_No | Unit_Weight
-------------+-------------
Albany City  |        .005
Alden Centra |          0
Amherst Cent |          0
Amityville U |          0
Ardsley Unio |          0
Babylon Unio |          0
Baldwin Unio |          0
Baldwinsvill |          0
Ballston Spa |          0
Bay Shore Un |          0
Bayport-Blue |          0
Beacon City  |          0
Bellmore-Mer |          0
Bethlehem Ce |          0
Bethpage Uni |          0
Binghamton C |          0
Blind Brook- |          0
Brentwood Un |          0
Briarcliff M |          0
Brighton Cen |          0
Brockport Ce |          0
Bronxville U |          0
Brookhaven-C |          0
Buffalo City |        .683
Burnt Hills- |          0
Byram Hills  |          0
Carle Place  |          0
Center Moric |          0
Central Isli |          0
Chappaqua Ce |          0
Cheektowaga  |          0
Cheektowaga- |          0
Cheektowaga- |          0
Chenango For |          0
Chenango Val |          0
Clarkstown C |          0
Cleveland Hi |          0
```

Clinton Cent	0
Cohoes City	0
Cold Spring	0
Commack Unio	0
Connetquot C	0
Copiague Uni	0
Cornwall Cen	0
Croton-Harmo	0
Deer Park Un	0
Depew Union	0
Dobbs Ferry	0
Dunkirk City	0
East Aurora	0
East Irondeq	0
East Meadow	0
East Ramapo	0
East Rochest	0
East Rockawa	0
Eastchester	0
Eden Central	0
Edgemont Uni	0
Elmira City	.193
Elmira Heigh	0
Elwood Union	0
Fairport Cen	0
Farmingdale	0
Fayetteville	0
Fort Edward	0
Freeport Uni	0
Frontier Cen	0
Garden City	0
Gates-Chili	0
Glen Cove Ci	0
Glens Falls	0
Grand Island	0
Great Neck U	0
Greece Centr	0
Green Island	0
Greenburgh C	0
Greenburgh E	.072
Guilderland	0
Half Hollow	0
Hamburg Cent	0
Hampton Bays	0
Harborfields	0
Harrison Cen	0
Hastings-On-	0
Hauppauge Un	0
Haverstraw-S	0
Hawthorne-Ce	0
Hempstead Un	0
Hendrick Hud	0
Herricks Uni	0
Hicksville U	0
Highland Cen	0
Highland Fal	0
Hilton Centr	0
Horseheads C	0
Hudson City	0
Hudson Falls	0
Huntington U	0
Hyde Park Ce	0
Irvington Un	0
Island Trees	0
Islip Union	0
Ithaca City	0
Jamesville-D	0
Jericho Unio	0
Johnson City	0
Katonah-Lewi	0
Kenmore-Tona	0
Kings Park C	0
Kingston Cit	0
Lackawanna C	0
Lakeland Cen	0

Lancaster Ce	0
Lansingburgh	0
Lawrence Uni	0
Levittown Un	0
Lindenhurst	0
Liverpool Ce	0
Locust Valle	0
Long Beach C	0
Longwood Cen	0
Lynbrook Uni	0
Mahopac Cent	0
Maine-Endwel	0
Malverne Uni	0
Mamaroneck U	0
Manhasset Un	0
Marcellus Ce	0
Marlboro Cen	0
Massapequa U	0
Middle Count	0
Middletown C	0
Miller Place	0
Mineola Unio	0
Mount Pleasa	0
Mount Sinai	0
Mount Vernon	0
Nanuet Union	0
New Hartford	0
New Rochelle	0
New York Mil	0
Newburgh Cit	0
Niagara Fall	0
Niskayuna Ce	0
North Babylo	0
North Shore	0
North Syracu	0
North Tonawa	0
Northport-Ea	0
Nyack Union	0
Oceanside Un	0
Orchard Park	0
Oriskany Cen	0
Ossining Uni	0
Oyster Bay-E	0
Patchogue-Me	0
Pearl River	0
Pelham Union	0
Penfield Cen	0
Phoenix Cent	0
Pittsford Ce	0
Plainedge Un	0
Plainview-Ol	0
Pleasantvill	0
Port Chester	0
Port Jeffers	0
Port Washing	0
Poughkeepsie	.047
Queensbury U	0
Ramapo Centr	0
Rensselaer C	0
Rochester Ci	0
Rockville Ce	0
Rocky Point	0
Roosevelt Un	0
Roslyn Union	0
Rotterdam-Mo	0
Rush-Henriet	0
Rye City Sch	0
Rye Neck Uni	0
Sachem Centr	0
Saratoga Spr	0
Saugerties C	0
Sayville Uni	0
Scarsdale Un	0
Schenectady	0
Scotia-Glenv	0

```
Seaford Unio |           0
Sewanhaka Ce |           0
Shenendehowa |           0
Shoreham-Wad |           0
Smithtown Ce |           0
Solvay Union |           0
Somers Centr |           0
South Coloni |           0
South Countr |           0
South Glens  |           0
South Huntin |           0
South Orange |           0
Spackenkill  |           0
Spencerport  |           0
Susquehanna  |           0
Sweet Home C |           0
Syosset Cent |           0
Three Villag |           0
Tonawanda Ci |           0
Troy City Sc |           0
Tuckahoe Uni |           0
Union Free S |           0
Union-Endico |           0
Utica City S |           0
Valhalla Uni |           0
Valley Strea |           0
Vestal Centr |           0
Victor Centr |           0
Wallkill Cen |           0
Wantagh Unio |           0
Wappingers C |           0
Washingtonvi |           0
Watervliet C |           0
Webster Cent |           0
West Babylon |           0
West Genesee |           0
West Hempste |           0
West Irondeq |           0
West Islip U |           0
West Seneca  |           0
Westbury Uni |           0
Westhampton  |           0
Westhill Cen |           0
White Plains |           0
Whitesboro C |           0
William Floy |           0
Williamsvill |           0
Wyandanch Un |           0
Yonkers City |           0
-------------------------
```

Predictor Balance:

	Treated	Synthetic
grad(2001(1)2006)	59.92825	59.93148
grad(2007)	52.19123	52.20273
p_lunch	.6195215	.6193702
p_black	.4892273	.4830118
p_hispanic	.086742	.120363

```
.
.         graph save Graph gradspec4a, replace
(note: file gradspec4a.gph not found)
(file gradspec4a.gph saved)

.
.         synth_runner grad grad(2001(1)2006) grad(2007) ///
>                 p_lunch p_black p_hispanic, ///
>                 trunit(205) trperiod(2008) gen_vars  keep(gspec4b.dta) replace
Estimating the treatment effects
Estimating the possible placebo effects (one set for each of the 1 treatment periods)
----+--- 1 ---+--- 2 ---+--- 3 ---+--- 4 ---+--- 5 Total: 236
.................................................. 55.00s elapsed. 3.42m remaining
.................................................. 1.85m elapsed. 2.50m remaining
.................................................. 2.87m elapsed. 98.00s remaining
.................................................. 4.10m elapsed. 44.00s remaining
..................................|  4.75m elapsed.

Conducting inference: 5 steps, and 236 placebo averages
Step 1... Finished
Step 2... Finished
Step 3... Finished
Step 4... Finished
Step 5... Finished

Post-treatment results: Effects, p-values, standardized p-values

             | estimates      pvals  pvals_std
-------------+----------------------------------
          c1 | -8.904108    .059322   .0381356
          c2 | -2.038156   .5084746   .5211864
          c3 | -1.913391   .5932203   .6101695

.
.         // see saved statistics, save pvals to a matrix
.
.         ereturn list

scalars:
               e(n_pl) =  236
          e(n_pl_used) =  236
    e(pval_joint_post) =  .173728813559322
  e(pval_joint_post_s
    td)                =  .1906779661016949
    e(avg_pre_rmspe_p) =  .4788135593220339

macros:
           e(trperiod) : "2008"
             e(trunit) : "205"
         e(treat_type) : "single unit"
             e(depvar) : "grad"
                e(cmd) : "synth_runner"
         e(properties) : "b"

matrices:
                   e(b) :  1 x 3
          e(pvals_std) :  1 x 3
              e(pvals) :  1 x 3
      e(treat_control) :  10 x 2

.         matrix p4 = e(pvals)

.
```

```
.         // get standard plot of means, as well as gap between TX and synthetic cont
> rol
.
.         effect_graphs, treated_name(Syracuse) sc_name(Synthetic Syracuse) ///
>                 tc_gname(syr1) tc_ytitle(Graduation Rate) ///
>                 tc_options(title("Specification 4 (Full Donor Pool)") ///
>                         xlabel(2001(2)2010) xtitle("") nodraw) ///
>                 effect_gname(syr2)  effect_ytitle(Gap in Graduation Rate) ///
>                 effect_options(title("Specification 4 (Full Donor Pool)") ///
>                         xlabel(2001(2)2010) xtitle("") nodraw) trlinediff(0)

.
.         graph save syr1 gradspec4, replace
(note: file gradspec4.gph not found)
(file gradspec4.gph saved)

.         graph save syr2 gradspec4gap, replace
(note: file gradspec4gap.gph not found)
(file gradspec4gap.gph saved)

.
.         // plot the gap for TX vs all of the placebos
.
.         single_treatment_graphs, do_color(gs12) treated_name(Syracuse) ///
>                 raw_gname(syr3) raw_options(title("Specification 4 (Full Donor Pool
> )") ///
>                         xlabel(2001(2)2010) xtitle("") nodraw) ///
>                 effects_gname(syr4) effects_options(title("Specification 4 (Full Do
> nor Pool)") ///
>                         xlabel(2001(2)2010) xtitle("") nodraw) trlinediff(0)

.
.         graph save syr3 gradspec4placebo, replace
(note: file gradspec4placebo.gph not found)
(file gradspec4placebo.gph saved)

.         graph save syr4 gradspec4placebogap, replace
(note: file gradspec4placebogap.gph not found)
(file gradspec4placebogap.gph saved)

.
.         // plot pvalue by time period
.
.         pval_graphs, pvals_options(title("Specification 4 (Full Donor Pool): pvalue
> s") xtitle("") nodraw) ///
>                  pvals_std_options(title("Specification 4 (Full Donor Pool): pvalue
> s (std)") xtitle("") nodraw)

.
.         graph save pvals gradspec4pvals, replace
(note: file gradspec4pvals.gph not found)
(file gradspec4pvals.gph saved)

.         graph save pvals_std gradspec4pvalsstd, replace
(note: file gradspec4pvalsstd.gph not found)
(file gradspec4pvalsstd.gph saved)

.
.         drop pre_rmspe - grad_synth

.
.
.         // ************************************************************************
```

```
.         // Specification 4 - restricted donor pool
.
.         preserve

.         keep if target_donor==1
(2,140 observations deleted)

.
.         synth grad grad(2001(1)2006) grad(2007) ///
>                 p_lunch p_black p_hispanic, fig ///
>                 trunit(205) trperiod(2008) keep(gspec4r.dta) replace
-------------------------------------------------------------------------------
Synthetic Control Method for Comparative Case Studies
-------------------------------------------------------------------------------

First Step: Data Setup
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
Data Setup successful
-------------------------------------------------------------------------------
               Treated Unit: Syracuse Cit
              Control Units: Albany City, Amityville U, Brentwood Un, Buffalo City,
                             Central Isli, Dunkirk City, East Ramapo, Hempstead Un,
                             Hudson City, Middletown C, Mount Vernon, Newburgh Cit,
                             Niagara Fall, Poughkeepsie, Rochester Ci, Roosevelt Un,
                             Schenectady, Troy City Sc, Utica City S, Westbury Uni,
                             Wyandanch Un, Yonkers City
-------------------------------------------------------------------------------
          Dependent Variable: grad
  MSPE minimized for periods: 2001 2002 2003 2004 2005 2006 2007
Results obtained for periods: 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010
-------------------------------------------------------------------------------
                  Predictors: grad(2001(1)2006) grad(2007) p_lunch p_black p_hispanic
-------------------------------------------------------------------------------
Unless period is specified
predictors are averaged over: 2001 2002 2003 2004 2005 2006 2007
-------------------------------------------------------------------------------

Second Step: Run Optimization
-------------------------------------------------------------------------------
-------------------------------------------------------------------------------
Optimization done
-------------------------------------------------------------------------------

Third Step: Obtain Results
-------------------------------------------------------------------------------
Loss: Root Mean Squared Prediction Error

---------------------
   RMSPE |  2.121819
---------------------
-------------------------------------------------------------------------------
Unit Weights:

--------------------------
       Co_No | Unit_Weight
-------------+------------
Albany City  |           0
Amityville U |           0
Brentwood Un |           0
Buffalo City |        .565
Central Isli |           0
Dunkirk City |           0
East Ramapo  |           0
Hempstead Un |           0
Hudson City  |        .016
Middletown C |           0
Mount Vernon |           0
Newburgh Cit |           0
Niagara Fall |           0
Poughkeepsie |           0
Rochester Ci |        .174
Roosevelt Un |           0
Schenectady  |        .245
Troy City Sc |           0
```

```
Utica City S |           0
Westbury Uni |           0
Wyandanch Un |           0
Yonkers City |           0
-------------------------
--------------------------------------------------------------------------------
Predictor Balance:

-----------------------------------------------------
                              |   Treated  Synthetic
------------------------------+----------------------
            grad(2001(1)2006) |  59.92825   59.98698
                   grad(2007) |  52.19123   52.27085
                      p_lunch |  .6195215   .6224193
                      p_black |  .4892273   .5017419
                    p_hispanic |   .086742   .1393021
-----------------------------------------------------
--------------------------------------------------------------------------------

.
.         graph save Graph gradspec4ra, replace
(note: file gradspec4ra.gph not found)
(file gradspec4ra.gph saved)

.
.         synth_runner grad grad(2001(1)2006) grad(2007)  ///
>                 p_lunch p_black p_hispanic, ///
>                 trunit(205) trperiod(2008) gen_vars keep(gspec4rb.dta) replace
Estimating the treatment effects
Estimating the possible placebo effects (one set for each of the 1 treatment periods)
|                    | Total: 22
.....................| 3.00s elapsed.

Conducting inference: 5 steps, and 22 placebo averages
Step 1... Finished
Step 2... Finished
Step 3... Finished
Step 4... Finished
Step 5... Finished

Post-treatment results: Effects, p-values, standardized p-values

             | estimates      pvals  pvals_std
-------------+----------------------------------
          c1 | -5.845514   .3181818   .0909091
          c2 | -1.163696   .8636364   .6363636
          c3 | -1.881682   .7727273   .5909091


.
.         // see saved statistics, save pvals to a matrix
.
.         ereturn list

scalars:
               e(n_pl) =  22
          e(n_pl_used) =  22
    e(pval_joint_post) =  .6363636363636364
  e(pval_joint_post_s
    td)                =  .2727272727272727
    e(avg_pre_rmspe_p) =  .9090909090909091

macros:
           e(trperiod) : "2008"
             e(trunit) : "205"
         e(treat_type) : "single unit"
             e(depvar) : "grad"
                e(cmd) : "synth_runner"
         e(properties) : "b"

matrices:
                   e(b) :  1 x 3
           e(pvals_std) :  1 x 3
               e(pvals) :  1 x 3
      e(treat_control) :  10 x 2
```

```
.         matrix p4r = e(pvals)

.
.         // get standard plot of means, as well as gap between TX
.         // and synthetic control
.
.         effect_graphs, treated_name(Syracuse) sc_name(Synthetic Syracuse) ///
>                 tc_gname(syr1) tc_ytitle(Graduation Rate) ///
>                 tc_options(title("Specification 4 (Restricted Donor Pool)") ///
>                         xlabel(2001(2)2010) xtitle("") nodraw) ///
>                 effect_gname(syr2)  effect_ytitle(Gap in Graduation Rate) ///
>                 effect_options(title("Specification 4 (Restricted Donor Pool)") ///
>                         xlabel(2001(2)2010) xtitle("") nodraw) trlinediff(0)

.
.         graph save syr1 gradspec4r, replace
(note: file gradspec4r.gph not found)
(file gradspec4r.gph saved)

.         graph save syr2 gradspec4rgap, replace
(note: file gradspec4rgap.gph not found)
(file gradspec4rgap.gph saved)

.
.         // plot the gap for TX vs all of the placebos
.
.         single_treatment_graphs, do_color(gs12) treated_name(Syracuse) ///
>                 raw_gname(syr3) raw_options(title("Specification 4 (Restricted Dono
> r Pool)") ///
>                         xlabel(2001(2)2010) xtitle("") nodraw) ///
>                 effects_gname(syr4) effects_options(title("Specification 4 (Restric
> ted Donor Pool)") ///
>                         xlabel(2001(2)2010) xtitle("") nodraw) trlinediff(0)

.
.         graph save syr3 gradspec4rplacebo, replace
(note: file gradspec4rplacebo.gph not found)
(file gradspec4rplacebo.gph saved)

.         graph save syr4 gradspec4rplacebogap, replace
(note: file gradspec4rplacebogap.gph not found)
(file gradspec4rplacebogap.gph saved)

.
.         // plot pvalue by time period
.
.         pval_graphs, pvals_options(title("Specification 4 (Restricted Donor Pool):
> pvalues") xtitle("") nodraw) ///
>                  pvals_std_options(title("Specification 4 (Restricted Donor Pool):
> pvalues (std)") xtitle("") nodraw)

.
.         graph save pvals gradspec4rpvals, replace
(note: file gradspec4rpvals.gph not found)
(file gradspec4rpvals.gph saved)

.         graph save pvals_std gradspec4rpvalsstd, replace
(note: file gradspec4rpvalsstd.gph not found)
(file gradspec4rpvalsstd.gph saved)

.
.         capture graph close _all
```

```
.         matrix dir
          p4r[1,3]
           p4[1,3]
          p2r[1,3]
           p2[1,3]

.
.
. // ***************************************************************************
. // Combine graphs and results files
. // ***************************************************************************
.
.         // Enrollment
.
.         graph combine enrollmentspec2a.gph enrollmentspec2ra.gph ///
>                                 enrollmentspec4a.gph enrollmentspec4ra.gph, ///
>                                 cols(2) name(enrollmenta, replace)

.         graph save   enrollmenta.gph, replace
(file enrollmenta.gph saved)

.         graph export enrollmenta.png, as(png) replace
(file enrollmenta.png written in PNG format)

.
.         graph combine enrollmentspec2.gph enrollmentspec2r.gph ///
>                                 enrollmentspec4.gph enrollmentspec4r.gph, ///
>                                 cols(2) name(enrollment, replace)

.         graph save   enrollment.gph, replace
(file enrollment.gph saved)

.         graph export enrollment.png, as(png) replace
(file enrollment.png written in PNG format)

.
.         graph combine enrollmentspec2gap.gph enrollmentspec2rgap.gph ///
>                                 enrollmentspec4gap.gph enrollmentspec4rgap.gph, /
> //
>                                 cols(2) name(enrollmentgap, replace)

.         graph save   enrollmentgap.gph, replace
(file enrollmentgap.gph saved)

.         graph export enrollmentgap.png, as(png) replace
(file enrollmentgap.png written in PNG format)

.
.         graph combine enrollmentspec2placebo.gph enrollmentspec2rplacebo.gph ///
>                                 enrollmentspec4placebo.gph enrollmentspec4rplaceb
> o.gph, ///
>                                 cols(2) name(enrollmentplacebo, replace)

.         graph save   enrollmentplacebo.gph, replace
(file enrollmentplacebo.gph saved)

.         graph export enrollmentplacebo.png, as(png) replace
(file enrollmentplacebo.png written in PNG format)

.
.         graph combine enrollmentspec2placebogap.gph enrollmentspec2rplacebogap.gph
> ///
>                                 enrollmentspec4placebogap.gph enrollmentspec4rpla
> cebogap.gph, ///
>                                 cols(2) name(enrollmentplacebogap, replace)
```

```
.         graph save   enrollmentplacebogap.gph, replace
(file enrollmentplacebogap.gph saved)

.         graph export enrollmentplacebogap.png, as(png) replace
(file enrollmentplacebogap.png written in PNG format)

.
.         graph combine enrollmentspec2pvals.gph enrollmentspec2rpvals.gph ///
>                                 enrollmentspec4pvals.gph enrollmentspec4rpvals.gp
> h, ///
>                                 cols(2) name(enrollmentpvals, replace)

.         graph save   enrollmentpvals.gph, replace
(file enrollmentpvals.gph saved)

.         graph export enrollmentpvals.png, as(png) replace
(file enrollmentpvals.png written in PNG format)

.         graph close _all

.
.         // Graduation rates
.
.         graph combine gradspec2a.gph gradspec2ra.gph ///
>                                 gradspec4a.gph gradspec4ra.gph, ///
>                                 cols(2) name(grad, replace)

.         graph save   grada.gph, replace
(file grada.gph saved)

.         graph export grada.png, as(png) replace
(file grada.png written in PNG format)

.
.         graph combine gradspec2.gph gradspec2r.gph ///
>                                 gradspec4.gph gradspec4r.gph, ///
>                                 cols(2) name(grad, replace)

.         graph save   grad.gph, replace
(file grad.gph saved)

.         graph export grad.png, as(png) replace
(file grad.png written in PNG format)

.
.         graph combine gradspec2gap.gph gradspec2rgap.gph ///
>                                 gradspec4gap.gph gradspec4rgap.gph, ///
>                                 cols(2) name(gradgap, replace)

.         graph save   gradgap.gph, replace
(file gradgap.gph saved)

.         graph export gradgap.png, as(png) replace
(file gradgap.png written in PNG format)

.
.         graph combine gradspec2placebo.gph gradspec2rplacebo.gph ///
>                                 gradspec4placebo.gph gradspec4rplacebo.gph, ///
>                                 cols(2) name(gradplacebo, replace)

.         graph save   gradplacebo.gph, replace
(file gradplacebo.gph saved)
```

```
.         graph export gradplacebo.png, as(png) replace
(file gradplacebo.png written in PNG format)

.
.         graph combine gradspec2placebogap.gph gradspec2rplacebogap.gph ///
>                                   gradspec4placebogap.gph gradspec4rplacebogap.gph,
>  ///
>                                   cols(2) name(gradplacebogap, replace)

.         graph save   gradplacebogap.gph, replace
(file gradplacebogap.gph saved)

.         graph export gradplacebogap.png, as(png) replace
(file gradplacebogap.png written in PNG format)

.
.         graph combine gradspec2pvals.gph gradspec2rpvals.gph ///
>                                   gradspec4pvals.gph gradspec4rpvals.gph, ///
>                                   cols(2) name(gradpvals, replace)

.         graph save   gradpvals.gph, replace
(file gradpvals.gph saved)

.         graph export gradpvals.png, as(png) replace
(file gradpvals.png written in PNG format)

.         graph close _all

.
.         // collect treatment effect estimates and weights from synth command
.
.         use espec2.dta, clear

.         gen results="enrollment spec 2 full"

.         append using espec2r.dta
(label id already defined)

.         replace results="enrollment spec 2 restricted" if results==""
variable results was str22 now str28
(22 real changes made)

.         append using espec4.dta
(label id already defined)

.         replace results="enrollment spec 4 full" if results==""
(275 real changes made)

.         append using espec4r.dta
(label id already defined)

.         replace results="enrollment spec 4 restricted" if results==""
(22 real changes made)

.         preserve
already preserved
r(621);

end of do-file

r(621);

. restore
nothing to restore
r(622);
```

```
. do "C:\Users\corcorsp\AppData\Local\Temp\STD3022c_000000.tmp"

.
.         use espec2.dta, clear

.         gen results="enrollment spec 2 full"

.         append using espec2r.dta
(label id already defined)

.         replace results="enrollment spec 2 restricted" if results==""
variable results was str22 now str28
(22 real changes made)

.         append using espec4.dta
(label id already defined)

.         replace results="enrollment spec 4 full" if results==""
(275 real changes made)

.         append using espec4r.dta
(label id already defined)

.         replace results="enrollment spec 4 restricted" if results==""
(22 real changes made)

.         preserve

.         drop if _time==.
(538 observations deleted)

.         keep _Y* _time results

.         rename _Y_treated meantreat

.         rename _Y_synthetic meansynth

.         rename _time year

.         save teffects_enroll.dta, replace
file teffects_enroll.dta saved

.         restore

.         preserve

.         keep results _Co _W

.         drop if _W==0
(576 observations deleted)

.         rename _Co district

.         rename _W weight

.         save weights_enroll.dta, replace
file weights_enroll.dta saved

.         restore

.
.         use gspec2.dta, clear
```

```
.         gen results="graduation spec 2 full"

.         append using gspec2r.dta
(label id already defined)

.         replace results="graduation spec 2 restricted" if results==""
variable results was str22 now str28
(22 real changes made)

.         append using gspec4.dta
(label id already defined)

.         replace results="graduation spec 4 full" if results==""
(236 real changes made)

.         append using gspec4r.dta
(label id already defined)

.         replace results="graduation spec 4 restricted" if results==""
(22 real changes made)

.         preserve

.         drop if _time==.
(476 observations deleted)

.         keep _Y* _time results

.         rename _Y_treated meantreat

.         rename _Y_synthetic meansynth

.         rename _time year

.         save teffects_grad.dta, replace
file teffects_grad.dta saved

.         restore

.         preserve

.         keep results _Co _W

.         drop if _W==0
(499 observations deleted)

.         rename _Co district

.         rename _W weight

.         save weights_grad.dta, replace
file weights_grad.dta saved

.         restore

.
end of do-file

. do "C:\Users\corcorsp\AppData\Local\Temp\STD3022c_000000.tmp"

.
. capture erase enrollmentspec2a.gph
```

```
. capture erase enrollmentspec2ra.gph
. capture erase enrollmentspec4a.gph
. capture erase enrollmentspec4ra.gph
.
. capture erase enrollmentspec2.gph
. capture erase enrollmentspec2r.gph
. capture erase enrollmentspec4.gph
. capture erase enrollmentspec4r.gph
.
. capture erase enrollmentspec2gap.gph
. capture erase enrollmentspec2rgap.gph
. capture erase enrollmentspec4gap.gph
. capture erase enrollmentspec4rgap.gph
.
. capture erase enrollmentspec2placebo.gph
. capture erase enrollmentspec2rplacebo.gph
. capture erase enrollmentspec4placebo.gph
. capture erase enrollmentspec4rplacebo.gph
.
. capture erase enrollmentspec2placebogap.gph
. capture erase enrollmentspec2rplacebogap.gph
. capture erase enrollmentspec4placebogap.gph
. capture erase enrollmentspec4rplacebogap.gph
.
. capture erase enrollmentspec2pvals.gph
. capture erase enrollmentspec2rpvals.gph
. capture erase enrollmentspec4pvals.gph
. capture erase enrollmentspec4rpvals.gph
.
. capture erase enrollmentspec2pvalsstd.gph
. capture erase enrollmentspec2rpvalsstd.gph
. capture erase enrollmentspec4pvalsstd.gph
. capture erase enrollmentspec4rpvalsstd.gph
.
. capture erase gradspec2a.gph
```

```
. capture erase gradspec2ra.gph
. capture erase gradspec4a.gph
. capture erase gradspec4ra.gph
.
. capture erase gradspec2.gph
. capture erase gradspec2r.gph
. capture erase gradspec4.gph
. capture erase gradspec4r.gph
.
. capture erase gradspec2gap.gph
. capture erase gradspec2rgap.gph
. capture erase gradspec4gap.gph
. capture erase gradspec4rgap.gph
.
. capture erase gradspec2placebo.gph
. capture erase gradspec2rplacebo.gph
. capture erase gradspec4placebo.gph
. capture erase gradspec4rplacebo.gph
.
. capture erase gradspec2placebogap.gph
. capture erase gradspec2rplacebogap.gph
. capture erase gradspec4placebogap.gph
. capture erase gradspec4rplacebogap.gph
.
. capture erase gradspec2pvals.gph
. capture erase gradspec2rpvals.gph
. capture erase gradspec4pvals.gph
. capture erase gradspec4rpvals.gph
.
. capture erase gradspec2pvalsstd.gph
. capture erase gradspec2rpvalsstd.gph
. capture erase gradspec4pvalsstd.gph
. capture erase gradspec4rpvalsstd.gph
.
. foreach k in e g {
  2. foreach j in 2 2r 4 4r {
  3.     capture erase `k'spec`j'.dta
  4.     }
  5.     }
.
. log close
```