

csdid with RC/Panel

First. Some other tools. Please copy [this](#) file, run it, and type:

```
** just for data example
ssc install frause
** for installing csdid2
fra install fra
fra install csdid2
```

Now the example.

First Run csdid with panel data

```
frause mpdta, clear
set seed 1
csdid lemp, ivar( countyreal) gvar(first) time(year)
```

(Written by R.)

.....

Difference-in-difference with Multiple Time Periods

Number of obs = 2,500

Outcome model : regression adjustment

Treatment model: none

	Coefficient	Std. err.	z	P> z	[95% conf. interval]	
g2004						
t_2003_2004	-.0105032	.023251	-0.45	0.651	-.0560744	.0350679
t_2003_2005	-.0704232	.0309848	-2.27	0.023	-.1311522	-.0096941
t_2003_2006	-.1372587	.0364357	-3.77	0.000	-.2086713	-.0658461
t_2003_2007	-.1008114	.0343592	-2.93	0.003	-.1681542	-.0334685

g2006							
t_2003_2004		.0065201	.0233268	0.28	0.780	-.0391996	.0522398
t_2004_2005		-.0027508	.0195586	-0.14	0.888	-.0410849	.0355833
t_2005_2006		-.0045946	.0177552	-0.26	0.796	-.0393942	.0302049
t_2005_2007		-.0412245	.0202292	-2.04	0.042	-.0808729	-.001576
-----+							
g2007							
t_2003_2004		.0305067	.0150336	2.03	0.042	.0010414	.0599719
t_2004_2005		-.0027259	.0163958	-0.17	0.868	-.0348611	.0294093
t_2005_2006		-.0310871	.0178775	-1.74	0.082	-.0661264	.0039522
t_2006_2007		-.0260544	.0166554	-1.56	0.118	-.0586985	.0065896
-----+							

Control: Never Treated

See Callaway and Sant'Anna (2021) for details

Then, drop at random 10% of the data, so technically have unbalanced panel. It can be estimated using repeated crosssection

```
drop if runiform()<.1
** as Panel with unbalanced Data
csdid lemp, ivar( countyreal) gvar(first) time(year)
```

(239 observations deleted)

Panel is not balanced

Will use observations with Pair balanced (observed at t0 and t1)

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Difference-in-difference with Multiple Time Periods

Number of obs = 2,227

Outcome model : regression adjustment

Treatment model: none

		Coefficient	Std. err.	z	P> z	[95% conf. interval]	
-----+							
g2004							
t_2003_2004		-.0062926	.0225497	-0.28	0.780	-.0504892	.037904
t_2003_2005		-.0960718	.0357584	-2.69	0.007	-.1661569	-.0259866
t_2003_2006		-.1633641	.0417271	-3.92	0.000	-.2451478	-.0815804
t_2003_2007		-.1295976	.03268	-3.97	0.000	-.1936492	-.0655459
-----+							
g2006							

t_2003_2004		-.0056589	.0259825	-0.22	0.828	-.0565836	.0452658
t_2004_2005		.0014362	.0200922	0.07	0.943	-.0379438	.0408162
t_2005_2006		.0007738	.0189435	0.04	0.967	-.0363548	.0379024
t_2005_2007		-.0424921	.0208849	-2.03	0.042	-.0834256	-.0015585

g2007							
t_2003_2004		.0351093	.0170156	2.06	0.039	.0017593	.0684593
t_2004_2005		.0040527	.0170957	0.24	0.813	-.0294543	.0375596
t_2005_2006		-.0326528	.0197723	-1.65	0.099	-.0714057	.0061001
t_2006_2007		-.0367615	.0166226	-2.21	0.027	-.0693412	-.0041819

Control: Never Treated

See Callaway and Sant'Anna (2021) for details

```
** As RC
csdid lemp, cluster( countyreal) gvar(first) time(year)
```

.....
Difference-in-difference with Multiple Time Periods

Number of obs = 2,261

Outcome model : regression adjustment

Treatment model: none

(Std. err. adjusted for 500 clusters in countyreal)

		Coefficient	Std. err.	z	P> z	[95% conf. interval]	
-----+							
g2004							
t_2003_2004		-.1173444	.1395652	-0.84	0.400	-.3908872	.1561983
t_2003_2005		-.2553488	.2439786	-1.05	0.295	-.733538	.2228404
t_2003_2006		-.3608912	.1722595	-2.10	0.036	-.6985137	-.0232687
t_2003_2007		-.305137	.112898	-2.70	0.007	-.526413	-.083861
-----+							
g2006							
t_2003_2004		.1768316	.0896097	1.97	0.048	.0011998	.3524635
t_2004_2005		-.0357726	.0452432	-0.79	0.429	-.1244476	.0529023
t_2005_2006		-.0432086	.0603687	-0.72	0.474	-.161529	.0751118
t_2005_2007		-.0878768	.0868235	-1.01	0.311	-.2580476	.0822941
-----+							
g2007							

t_2003_2004		.0827665	.0756403	1.09	0.274	-.0654857	.2310188
t_2004_2005		-.0469567	.0626924	-0.75	0.454	-.1698316	.0759182
t_2005_2006		-.1242509	.0631495	-1.97	0.049	-.2480217	-.0004801
t_2006_2007		-.0591166	.0838097	-0.71	0.481	-.2233807	.1051475

Control: Never Treated

See Callaway and Sant'Anna (2021) for details

The second one produces odd results, which is not unexpected.

Now using the residuals Idea:

```
** Getting residuals
reghdfe lemp, abs( year countyreal) resid
** AS RC but with residuals
csdid _reghdfe_resid, cluster( countyreal) gvar(first) time(year)
```

(dropped 1 singleton observations)

(MWFE estimator converged in 5 iterations)

HDFE Linear regression	Number of obs	=	2,260
Absorbing 2 HDFE groups	F(0, 1757)	=	.
	Prob > F	=	.
	R-squared	=	0.9935
	Adj R-squared	=	0.9916
	Within R-sq.	=	0.0000
	Root MSE	=	0.1378

lemp		Coefficient	Std. err.	t	P> t	[95% conf. interval]
-----+						
_cons		5.78452	.0028984	1995.80	0.000	5.778835 5.790205

Absorbed degrees of freedom:

Absorbed FE		Categories	- Redundant	= Num. Coefs	
-----+					
year		5	0	5	
countyreal		499	1	498	

.....

Difference-in-difference with Multiple Time Periods

Number of obs = 2,260

Outcome model : regression adjustment

Treatment model: none

(Std. err. adjusted for 499 clusters in countyreal)

		Coefficient	Std. err.	z	P> z	[95% conf. interval]	
-----+-----							
g2004							
t_2003_2004		-.0144231	.0247539	-0.58	0.560	-.0629399	.0340936
t_2003_2005		-.0843181	.0330384	-2.55	0.011	-.1490721	-.0195641
t_2003_2006		-.1555145	.0381466	-4.08	0.000	-.2302805	-.0807484
t_2003_2007		-.1105423	.0356191	-3.10	0.002	-.1803544	-.0407302
-----+-----							
g2006							
t_2003_2004		-.0105662	.0261878	-0.40	0.687	-.0618934	.040761
t_2004_2005		-.0051092	.0202832	-0.25	0.801	-.0448636	.0346453
t_2005_2006		-.0040826	.0182119	-0.22	0.823	-.0397772	.031612
t_2005_2007		-.0347436	.0202887	-1.71	0.087	-.0745088	.0050216
-----+-----							
g2007							
t_2003_2004		.0254408	.0185718	1.37	0.171	-.0109592	.0618407
t_2004_2005		-.0038647	.0166224	-0.23	0.816	-.036444	.0287147
t_2005_2006		-.036962	.0187402	-1.97	0.049	-.073692	-.0002319
t_2006_2007		-.027827	.0166274	-1.67	0.094	-.060416	.004762

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See Callaway and Sant'Anna (2021) for details

I think this produces much better results! Not sure how would this translate in other frameworks, tho.