```
-------------------------------------------------------------------------------
-------------------------------------------------------
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_2.log
  log type:  text
 opened on:  23 Feb 2023, 10:22:00
.
. * table_2_a
.
. eststo clear
. eststo: reghdfe percent pm25_pref `controls0' , absorb(`absorb1')
vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(   1,   1025) =
10.85
Statistics robust to heteroskedasticity           Prob > F        =
0.0010
                                                  R-squared       =
0.4868
                                                  Adj R-squared   =
0.4602
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0000
Number of clusters (date_slot) =      1,026       Root MSE        =
441.3485

(Std. err. adjusted for 1,026 clusters in stud_id date_slot)
------------------------------------------------
             |               Robust
     percent | Coefficient  std. err.      t    P>|t|
-------------+----------------------------------------
   pm25_pref |     -0.325      0.099   -3.294   0.001
------------------------------------------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
```

```
(est1 stored)
. eststo: reghdfe percent pm25_pref `controls1' , absorb(`absorb1')
vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(   7,   1025) =
79.64
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4870
                                                  Adj R-squared   =
0.4604
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0003
Number of clusters (date_slot) =      1,026       Root MSE        =
441.2765

  (Std. err. adjusted for 1,026 clusters in stud_id date_slot)
------------------------------------------------------------------
                     |               Robust
             percent | Coefficient  std. err.      t    P>|t|
---------------------+--------------------------------------------
            pm25_pref |     -0.669      0.115   -5.816   0.000
      temp_daily_avg |      0.766      0.089    8.589   0.000
     precip_daily_avg |     18.965      2.425    7.821   0.000
     relhum_daily_avg |     -0.136      0.037   -3.712   0.000
      press_daily_avg |      2.533      0.576    4.396   0.000
winddir_cos_daily_avg |      1.631      0.117   13.994   0.000
winddir_sin_daily_avg |     -2.009      0.155  -12.937   0.000
------------------------------------------------------------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)
. eststo: reghdfe percent pm25_pref `controls2' , absorb(`absorb1')
vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
```

```
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,   1025) =
85.45
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,957         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1200

                      (Std. err. adjusted for 1,026 clusters in
```

```
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                                |               Robust
                                        percent | Coefficient  std. err.
t    P>|t|
-----------------------------------------------
+-----------------------------------------
                                     pm25_pref |     -0.607      0.124
-4.908   0.000
                                temp_daily_avg |     51.080      5.872
8.699   0.000
                               precip_daily_avg |   4188.076    332.424
12.599   0.000
                                                |
       c.temp_daily_avg#c.precip_daily_avg |     -6.623      0.545
-12.158   0.000
                                                |
                               relhum_daily_avg |      0.648      2.992
0.217   0.829
                                                |
       c.temp_daily_avg#c.relhum_daily_avg |      0.011      0.005
2.278   0.023
                                                |
                                press_daily_avg |      6.509      2.168
3.002   0.003
                                                |
        c.temp_daily_avg#c.press_daily_avg |     -0.503      0.057
-8.820   0.000
                                                |
                         winddir_cos_daily_avg |   -232.091     21.792
-10.650   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.259      0.023
11.253   0.000
                                                |
                         winddir_sin_daily_avg |    271.679     23.538
11.542   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.337   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.597      0.313
1.909   0.056
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -42.108      3.209
-13.121   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.750      0.441
-3.966   0.000
```

```
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.337      0.961
7.638   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.008      0.030
-0.285   0.776
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.393   0.694
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.160      0.014
-11.780   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.334      0.211
11.044   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.610      0.229
-11.416   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est3 stored)
.
. esttab using table_2_a.tex, ///
> keep(*pm25*) ///
> star(* 0.10 ** 0.05 *** 0.01) label stats(N, fmt(%9.0fc)
labels("Observations")) ///
> compress se(3) b(3) replace nogaps noomitted nomtitles ///
> indicate( ///
> "Weather Controls = temp_daily_avg" ///
> "Weather Interactions = *#c.precip_daily_avg*" ///
> , labels("Y" " ")) ///
> nonotes
(output written to table_2_a.tex)
.
. * table_2_b
.
. eststo clear
. eststo: reghdfe percent_no_scale pm25_pref `controls0' ,
```

```
absorb(`absorb1') vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(   1,   1025) =
10.85
Statistics robust to heteroskedasticity           Prob > F        =
0.0010
                                                  R-squared       =
0.4868
                                                  Adj R-squared   =
0.4602
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0000
Number of clusters (date_slot) =      1,026       Root MSE        =
220.6743

(Std. err. adjusted for 1,026 clusters in stud_id date_slot)
------------------------------------------------------------
             |               Robust
percent_no~e | Coefficient  std. err.      t    P>|t|
-------------+----------------------------------------------
   pm25_pref |     -0.163      0.049   -3.294   0.001
------------------------------------------------------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est1 stored)
. eststo: reghdfe percent_no_scale pm25_pref `controls1' ,
absorb(`absorb1') vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(   7,   1025) =
79.64
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
```

```
                                                R-squared       =
0.4870
                                                Adj R-squared   =
0.4604
Number of clusters (stud_id) =     88,959       Within R-sq.    =
0.0003
Number of clusters (date_slot) =      1,026     Root MSE        =
220.6382

  (Std. err. adjusted for 1,026 clusters in stud_id date_slot)
------------------------------------------------------------------
                        |               Robust
     percent_no_scale | Coefficient  std. err.      t    P>|t|
---------------------+--------------------------------------------
            pm25_pref |     -0.334      0.057   -5.816   0.000
       temp_daily_avg |      0.383      0.045    8.589   0.000
     precip_daily_avg |      9.482      1.212    7.821   0.000
     relhum_daily_avg |     -0.068      0.018   -3.712   0.000
      press_daily_avg |      1.267      0.288    4.396   0.000
winddir_cos_daily_avg |      0.815      0.058   13.994   0.000
winddir_sin_daily_avg |     -1.005      0.078  -12.937   0.000
------------------------------------------------------------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)
. eststo: reghdfe percent_no_scale pm25_pref `controls2' ,
absorb(`absorb1') vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
```

```
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,   1025) =
85.45
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,957         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
220.5600

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                                |               Robust
                           percent_no_scale | Coefficient  std. err.
t    P>|t|
-----------------------------------------------
+-----------------------------------------
                                  pm25_pref |     -0.304      0.062
-4.908   0.000
                              temp_daily_avg |     25.540      2.936
8.699   0.000
```

```
                          precip_daily_avg |   2094.038    166.212
12.599   0.000
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -3.311      0.272
-12.158   0.000
                                           |
                          relhum_daily_avg |      0.324      1.496
0.217   0.829
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.006      0.002
2.278   0.023
                                           |
                           press_daily_avg |      3.255      1.084
3.002   0.003
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.252      0.029
-8.820   0.000
                                           |
                      winddir_cos_daily_avg |   -116.046     10.896
-10.650   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.129      0.011
11.253   0.000
                                           |
                      winddir_sin_daily_avg |    135.840     11.769
11.542   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.242      0.013
-19.337   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.298      0.156
1.909   0.056
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -21.054      1.605
-13.121   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -0.875      0.221
-3.966   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      3.668      0.480
7.638   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.004      0.015
-0.285   0.776
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.002      0.006
-0.393   0.694
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.080      0.007
-11.780   0.000
```

```
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      1.167      0.106
11.044   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -1.305      0.114
-11.416   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est3 stored)
.
. esttab using table_2_b.tex, ///
> keep(*pm25*) ///
> star(* 0.10 ** 0.05 *** 0.01) label stats(N, fmt(%9.0fc)
labels("Observations")) ///
> compress se(3) b(3) replace nogaps noomitted nomtitles ///
> indicate( ///
> "Weather Controls = temp_daily_avg" ///
> "Weather Interactions = *#c.precip_daily_avg*" ///
> , labels("Y" " ")) ///
> nonotes
(output written to table_2_b.tex)
.
. * table_2_c
.
. eststo clear
. eststo: reghdfe percent pm25_pref `controls0' , absorb(`absorb2')
vce(clust `cluster') `display_options'
(MWFE estimator converged in 5 iterations)

HDFE Linear regression                            Number of obs   =
1,807,688
Absorbing 3 HDFE groups                           F(   1,   1025) =
19.60
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.0065
                                                  Adj R-squared   =
```

```
0.0065
Number of clusters (stud_id) =     90,134         Within R-sq.    =
0.0000
Number of clusters (date_slot) =      1,026       Root MSE        =
599.4763

(Std. err. adjusted for 1,026 clusters in stud_id date_slot)
------------------------------------------------
             |               Robust
     percent | Coefficient  std. err.      t    P>|t|
-------------+----------------------------------
   pm25_pref |     -0.596      0.135   -4.427   0.000
------------------------------------------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
(est1 stored)
. eststo: reghdfe percent pm25_pref `controls1' , absorb(`absorb2')
vce(clust `cluster') `display_options'
(MWFE estimator converged in 5 iterations)

HDFE Linear regression                            Number of obs   =
1,807,688
Absorbing 3 HDFE groups                           F(   7,   1025) =
26.03
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.0066
                                                  Adj R-squared   =
0.0066
Number of clusters (stud_id) =     90,134         Within R-sq.    =
0.0001
Number of clusters (date_slot) =      1,026       Root MSE        =
599.4484

  (Std. err. adjusted for 1,026 clusters in stud_id date_slot)
------------------------------------------------------------
                     |               Robust
             percent | Coefficient  std. err.      t    P>|t|
---------------------+--------------------------------------
           pm25_pref |     -0.944      0.156   -6.048   0.000
      temp_daily_avg |      0.719      0.121    5.961   0.000
```

```
     precip_daily_avg |     17.992      3.238    5.557   0.000
     relhum_daily_avg |     -0.094      0.050   -1.886   0.059
      press_daily_avg |      3.062      0.780    3.925   0.000
winddir_cos_daily_avg |      1.181      0.158    7.493   0.000
winddir_sin_daily_avg |     -0.965      0.210   -4.591   0.000
------------------------------------------------------------------------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
(est2 stored)
. eststo: reghdfe percent pm25_pref `controls2' , absorb(`absorb2')
vce(clust `cluster') `display_options'
(MWFE estimator converged in 5 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
```

```
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,807,688
Absorbing 3 HDFE groups                           F(  21,   1025) =
33.05
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.0069
                                                  Adj R-squared   =
0.0069
Number of clusters (stud_id) =     90,134         Within R-sq.    =
0.0004
Number of clusters (date_slot) =      1,026       Root MSE        =
599.3642

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
--------------------------------------------
+-----------------------------------------
                                  pm25_pref |     -0.783      0.168
-4.672   0.000
                              temp_daily_avg |     62.511      7.944
7.869   0.000
                             precip_daily_avg |   3619.105    447.835
8.081   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -5.510      0.731
-7.536   0.000
                                            |
                             relhum_daily_avg |     -8.504      4.063
-2.093   0.036
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.024      0.007
3.608   0.000
                                            |
                              press_daily_avg |      0.338      2.939
0.115   0.908
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.626      0.077
-8.114   0.000
                                            |
                        winddir_cos_daily_avg |   -269.638     29.565
```

```
-9.120   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.154      0.031
4.972   0.000
                                                |
                      winddir_sin_daily_avg |    142.911     31.958
4.472   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.242      0.034
-7.135   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.978      0.422
2.315   0.021
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -36.760      4.323
-8.504   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.307      0.580
-2.253   0.024
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      4.586      1.296
3.538   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |      0.082      0.040
2.027   0.043
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.016      0.016
1.042   0.297
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.047      0.018
-2.567   0.010
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.688      0.287
9.378   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -1.398      0.310
-4.503   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
(est3 stored)
```

```
.
. esttab using table_2_c.tex, ///
> keep(*pm25*) ///
> star(* 0.10 ** 0.05 *** 0.01) label stats(N, fmt(%9.0fc)
labels("Observations")) ///
> compress se(3) b(3) replace nogaps noomitted nomtitles ///
> indicate( ///
> "Weather Controls = temp_daily_avg" ///
> "Weather Interactions = *#c.precip_daily_avg*" ///
> , labels("Y" " ")) ///
> nonotes
(output written to table_2_c.tex)
.
. log close
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_2.log
  log type:  text
 closed on:  23 Feb 2023, 10:29:02
-------------------------------------------------------------------------
-------------------------------------------------------------
-------------------------------------------------------------------------
-------------------------------------------------------------
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_3.log
  log type:  text
 opened on:  23 Feb 2023, 15:59:53
.
. * table_3
. * figure_4
.
. eststo clear
.
. reghdfe percent zero i.pm25_bin `controls0' , absorb(`absorb1')
vce(clust `cluster')  `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: zero omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(   4,   1025) =
31.03
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4868
                                                  Adj R-squared   =
0.4602
```

```
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0001
Number of clusters (date_slot) =      1,026       Root MSE        =
220.6669

(Std. err. adjusted for 1,026 clusters in stud_id date_slot)
------------------------------------------------------------------
             |               Robust
     percent | Coefficient  std. err.      t    P>|t|
-------------+----------------------------------------------------
    pm25_bin |
         5-  |     -3.857      0.636   -6.068   0.000
        10-  |     -3.787      0.728   -5.200   0.000
        15-  |     -5.388      0.836   -6.441   0.000
        20+  |    -16.331      1.534  -10.649   0.000
------------------------------------------------------------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
. estimates store model1
.
. reghdfe percent zero i.pm25_bin `controls1' , absorb(`absorb1')
vce(clust `cluster')  `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: zero omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  10,   1025) =
70.12
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4870
                                                  Adj R-squared   =
0.4604
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0004
Number of clusters (date_slot) =      1,026       Root MSE        =
220.6290
```

```
  (Std. err. adjusted for 1,026 clusters in stud_id date_slot)
------------------------------------------------------------------------------
                     |               Robust
             percent | Coefficient  std. err.      t    P>|t|
---------------------+--------------------------------------------------------
             pm25_bin |
                  5-  |     -5.089      0.643   -7.919   0.000
                 10-  |     -6.257      0.762   -8.214   0.000
                 15-  |     -8.682      0.899   -9.660   0.000
                 20+  |    -18.805      1.568  -11.992   0.000
                      |
       temp_daily_avg |      0.414      0.044    9.416   0.000
     precip_daily_avg |     10.329      1.220    8.465   0.000
     relhum_daily_avg |     -0.060      0.018   -3.311   0.001
      press_daily_avg |      1.544      0.281    5.495   0.000
winddir_cos_daily_avg |      0.823      0.058   14.114   0.000
winddir_sin_daily_avg |     -1.025      0.078  -13.148   0.000
------------------------------------------------------------------------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
. estimates store model2
.
. reghdfe percent zero i.pm25_bin `controls2' , absorb(`absorb1')
vce(clust `cluster')  `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: zero omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  24,   1025) =
83.22
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,957         Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026       Root MSE        =
220.5469

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                          |               Robust
                                  percent | Coefficient  std. err.
t    P>|t|
----------------------------------------------
+-----------------------------------------
                                 pm25_bin |
                                      5-  |     -7.932      0.676
-11.733   0.000
                                     10-  |     -9.142      0.812
-11.258   0.000
```

```
                                        15-  |    -12.006      0.962
-12.484   0.000
                                        20+  |    -20.338      1.645
-12.365   0.000
                                             |
                              temp_daily_avg |     23.520      2.936
8.012   0.000
                            precip_daily_avg |   2194.681    167.712
13.086   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -3.307      0.273
-12.121   0.000
                                             |
                            relhum_daily_avg |     -3.972      1.533
-2.591   0.010
                                             |
       c.temp_daily_avg#c.relhum_daily_avg |      0.001      0.002
0.363   0.717
                                             |
                             press_daily_avg |      0.732      1.102
0.664   0.507
                                             |
        c.temp_daily_avg#c.press_daily_avg |     -0.228      0.029
-7.974   0.000
                                             |
                        winddir_cos_daily_avg |   -115.880     10.966
-10.567   0.000
                                             |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.133      0.012
11.490   0.000
                                             |
                        winddir_sin_daily_avg |    147.812     11.803
12.524   0.000
                                             |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.267      0.013
-21.007   0.000
                                             |
     c.precip_daily_avg#c.relhum_daily_avg |      0.339      0.156
2.167   0.030
                                             |
      c.precip_daily_avg#c.press_daily_avg |    -22.082      1.621
-13.623   0.000
                                             |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -0.800      0.221
-3.622   0.000
                                             |
c.precip_daily_avg#c.winddir_sin_daily_avg |      3.773      0.480
7.863   0.000
                                             |
      c.relhum_daily_avg#c.press_daily_avg |      0.039      0.015
```

```
2.551   0.011
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.006
-0.692   0.489
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.084      0.007
-12.342   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      1.166      0.106
10.972   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -1.421      0.115
-12.400   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
. estimates store model3
.
. coefplot(model1, label("No Controls"))(model3, label("With Weather
Controls and Interactions")msymbol(S) ciopts(lpattern(line))
>  ), keep(*zero* *pm25*) vertical omit ///
> graphregion(color(white)) bgcolor(white) ///
> xtitle("Final Exam PM2.5") xscale( titlegap(3)) xline() xlabel(1
"0-" 2 "5-" 3 "10-" 4 "15-" 5 "20+") ///
> ytitle("Final Grade (Standard Deviations)") yscale(titlegap(3))
yline(0)ylabel(, nogrid)
(note:  named style line not found in class linepattern, default
attributes used)
(note:  named style line not found in class linepattern, default
attributes used)
. graph export "figure_bin_dashed.pdf", as(pdf) replace
file /Users/nikolai/Dropbox/Research/Pollution Grades Revision/
Replication/figure_bin_dashed.pdf saved as PDF format
.
. esttab model1 model2 model3 using table_3.tex, ///
> keep(*pm25*) ///
> star(* 0.10 ** 0.05 *** 0.01) label stats(N, fmt(%9.0fc)
labels("Observations")) ///
> compress se(3) b(3) replace nogaps noomitted nomtitles ///
```

```
> indicate( ///
> "Weather Controls = temp_daily_avg" ///
> "Weather Interactions = *#c.precip_daily_avg*" ///
> , labels("Y" " ")) ///
> nonotes
(output written to table_3.tex)
.
. log close
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_3.log
  log type:  text
 closed on:  23 Feb 2023, 16:03:17
-------------------------------------------------------------------------------
-------------------------------------------------------------
-------------------------------------------------------------------------------
-------------------------------------------------------------
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_4a.log
  log type:  text
 opened on:  23 Feb 2023, 10:32:27
. *** table_4_a
. eststo clear
.
.         eststo : reghdfe percent pm25_pref pm25_lag_1_day-
pm25_lag_14_day `controls2' , absorb(`absorb1') vce(clust `cluster')
> `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
```

```
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  35,   1025) =
69.39
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4610
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0014
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0399

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
             |                Robust
             |      percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                  pm25_pref |     -1.294      0.143
-9.063   0.000
              pm25_lag_1_day |     -0.377      0.143
-2.630   0.009
              pm25_lag_2_day |     -1.322      0.134
-9.879   0.000
              pm25_lag_3_day |     -0.631      0.135
-4.665   0.000
              pm25_lag_4_day |     -0.560      0.138
-4.069   0.000
              pm25_lag_5_day |     -0.565      0.136
-4.168   0.000
              pm25_lag_6_day |     -1.455      0.136
```

```
-10.668   0.000
                          pm25_lag_7_day |      0.095      0.144
0.661   0.508
                          pm25_lag_8_day |     -1.020      0.144
-7.075   0.000
                          pm25_lag_9_day |      0.541      0.144
3.765   0.000
                         pm25_lag_10_day |     -1.925      0.142
-13.600   0.000
                         pm25_lag_11_day |      0.405      0.132
3.058   0.002
                         pm25_lag_12_day |     -0.697      0.135
-5.156   0.000
                         pm25_lag_13_day |      0.685      0.124
5.511   0.000
                         pm25_lag_14_day |     -0.432      0.126
-3.426   0.001
                          temp_daily_avg |     48.695      6.081
8.008   0.000
                        precip_daily_avg |   4291.647    340.598
12.600   0.000
                                         |
       c.temp_daily_avg#c.precip_daily_avg |     -7.480      0.571
-13.094   0.000
                                         |
                        relhum_daily_avg |      2.849      3.046
0.935   0.350
                                         |
       c.temp_daily_avg#c.relhum_daily_avg |      0.022      0.005
4.252   0.000
                                         |
                          press_daily_avg |      7.783      2.200
3.538   0.000
                                         |
        c.temp_daily_avg#c.press_daily_avg |     -0.482      0.059
-8.152   0.000
                                         |
                      winddir_cos_daily_avg |   -196.009     22.494
-8.714   0.000
                                         |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.247      0.024
10.517   0.000
                                         |
                      winddir_sin_daily_avg |    284.659     23.907
11.907   0.000
                                         |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.543      0.025
-21.360   0.000
                                         |
     c.precip_daily_avg#c.relhum_daily_avg |      0.517      0.320
```

```
1.613   0.107
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -43.083      3.286
-13.112   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.317      0.457
-5.067   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      4.820      0.982
4.909   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.031      0.030
-1.027   0.305
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.012      0.012
-1.047   0.295
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.162      0.014
-11.646   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      1.983      0.218
9.085   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.736      0.232
-11.784   0.000
------------------------------------------------------------------------------
------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est1 stored)
.         estadd scalar maxlag = 14

added scalar:
            e(maxlag) =  14
.
.         lincom pm25_pref

 ( 1)  pm25_pref = 0

------------------------------------------------------------------------------
```

```
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+------------------------------------------------------------------
         (1) |  -1.294212   .1428047    -9.06   0.000    -1.574105
-1.01432
------------------------------------------------------------------------
--------
.         estadd scalar imp_b = r(estimate)

added scalar:
              e(imp_b) =  -1.2942124
.         estadd scalar imp_s = r(se)

added scalar:
              e(imp_s) =  .14280473
.         estadd scalar imp_t = r(estimate) /r(se)

added scalar:
              e(imp_t) =  -9.062812
.
.         lincom
pm25_pref+pm25_lag_1_day+pm25_lag_2_day+pm25_lag_3_day+pm25_lag_4_day+
pm25_lag_5_day+pm25_lag_6_day+pm25_lag_7_d
>
ay+pm25_lag_8_day+pm25_lag_9_day+pm25_lag_10_day+pm25_lag_11_day+pm25_
lag_12_day+pm25_lag_13_day+pm25_lag_14_day

 ( 1)  pm25_pref + pm25_lag_1_day + pm25_lag_2_day + pm25_lag_3_day +
pm25_lag_4_day + pm25_lag_5_day + pm25_lag_6_day +
       pm25_lag_7_day + pm25_lag_8_day + pm25_lag_9_day +
pm25_lag_10_day + pm25_lag_11_day + pm25_lag_12_day + pm25_lag_13_day
+
       pm25_lag_14_day = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+------------------------------------------------------------------
         (1) |  -8.552349   .6121248   -13.97   0.000    -9.752092
-7.352606
------------------------------------------------------------------------
--------
.         estadd scalar cum_b = r(estimate)

added scalar:
              e(cum_b) =  -8.5523491
```

```
.         estadd scalar cum_s = r(se)

added scalar:
              e(cum_s) =  .6121248
.         estadd scalar cum_t = r(estimate) /r(se)

added scalar:
              e(cum_t) =  -13.971578
.
.         eststo : reghdfe percent pm25_pref pm25_lag_1_day-
pm25_lag_13_day `controls2' , absorb(`absorb1') vce(clust `cluster')
> `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  34,   1025) =
```

```
71.26
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4610
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0014
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0413

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-------------------------------------
                                 pm25_pref |     -1.249      0.142
-8.802   0.000
                           pm25_lag_1_day |     -0.410      0.143
-2.868   0.004
                           pm25_lag_2_day |     -1.248      0.132
-9.440   0.000
                           pm25_lag_3_day |     -0.625      0.135
-4.622   0.000
                           pm25_lag_4_day |     -0.512      0.137
-3.738   0.000
                           pm25_lag_5_day |     -0.531      0.135
-3.930   0.000
                           pm25_lag_6_day |     -1.407      0.135
-10.403   0.000
                           pm25_lag_7_day |      0.161      0.142
1.131   0.258
                           pm25_lag_8_day |     -0.993      0.144
-6.901   0.000
                           pm25_lag_9_day |      0.611      0.142
4.300   0.000
                          pm25_lag_10_day |     -1.887      0.141
-13.395   0.000
                          pm25_lag_11_day |      0.441      0.132
3.349   0.001
                          pm25_lag_12_day |     -0.571      0.130
-4.401   0.000
                          pm25_lag_13_day |      0.581      0.121
4.810   0.000
                           temp_daily_avg |     47.687      6.069
```

```
7.857   0.000
                          precip_daily_avg |   4246.722    340.472
12.473   0.000
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -7.595      0.571
-13.308   0.000
                                           |
                          relhum_daily_avg |      2.029      3.035
0.668   0.504
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.022      0.005
4.391   0.000
                                           |
                           press_daily_avg |      7.177      2.191
3.275   0.001
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.472      0.059
-8.001   0.000
                                           |
                      winddir_cos_daily_avg |   -185.672     22.271
-8.337   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.242      0.023
10.299   0.000
                                           |
                      winddir_sin_daily_avg |    278.871     23.835
11.700   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.537      0.025
-21.171   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.489      0.320
1.528   0.127
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -42.601      3.284
-12.972   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.308      0.457
-5.046   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      4.654      0.980
4.748   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.023      0.030
-0.761   0.447
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.017      0.012
-1.444   0.149
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.160      0.014
```

```
-11.525   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      1.883      0.216
8.714   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.680      0.231
-11.577   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)
.         estadd scalar maxlag = 13

added scalar:
             e(maxlag) =  13
.
.         lincom pm25_pref

 ( 1)  pm25_pref = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -1.248921   .1418933    -8.80   0.000    -1.527027
-.9708152
------------------------------------------------------------------------------
--------
.         estadd scalar imp_b = r(estimate)

added scalar:
              e(imp_b) =  -1.2489212
.         estadd scalar imp_s = r(se)

added scalar:
              e(imp_s) =  .14189333
.         estadd scalar imp_t = r(estimate) /r(se)
```

```
added scalar:
              e(imp_t) =  -8.8018314
.
.         lincom
pm25_pref+pm25_lag_1_day+pm25_lag_2_day+pm25_lag_3_day+pm25_lag_4_day+
pm25_lag_5_day+pm25_lag_6_day+pm25_lag_7_d
>
ay+pm25_lag_8_day+pm25_lag_9_day+pm25_lag_10_day+pm25_lag_11_day+pm25_
lag_12_day+pm25_lag_13_day

 ( 1)  pm25_pref + pm25_lag_1_day + pm25_lag_2_day + pm25_lag_3_day +
pm25_lag_4_day + pm25_lag_5_day + pm25_lag_6_day +
       pm25_lag_7_day + pm25_lag_8_day + pm25_lag_9_day +
pm25_lag_10_day + pm25_lag_11_day + pm25_lag_12_day + pm25_lag_13_day
=
       0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -7.636935   .5410079   -14.12   0.000    -8.697292
-6.576578
------------------------------------------------------------------------
--------
.         estadd scalar cum_b = r(estimate)

added scalar:
              e(cum_b) =  -7.636935
.         estadd scalar cum_s = r(se)

added scalar:
              e(cum_s) =  .54100792
.         estadd scalar cum_t = r(estimate) /r(se)

added scalar:
              e(cum_t) =  -14.116124
.
.         eststo : reghdfe percent pm25_pref pm25_lag_1_day-
pm25_lag_12_day `controls2' , absorb(`absorb1') vce(clust `cluster')
> `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  33,   1025) =
72.81
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4610
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0014
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0441

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                        |               Robust
                                percent | Coefficient  std. err.
```

```
t    P>|t|
-------------------------------------------
+-----------------------------------
                                  pm25_pref |     -1.226      0.142
-8.645   0.000
                             pm25_lag_1_day |     -0.434      0.143
-3.037   0.002
                             pm25_lag_2_day |     -1.291      0.132
-9.797   0.000
                             pm25_lag_3_day |     -0.637      0.135
-4.714   0.000
                             pm25_lag_4_day |     -0.568      0.136
-4.162   0.000
                             pm25_lag_5_day |     -0.586      0.134
-4.361   0.000
                             pm25_lag_6_day |     -1.490      0.134
-11.087   0.000
                             pm25_lag_7_day |      0.137      0.142
0.961   0.337
                             pm25_lag_8_day |     -1.067      0.143
-7.446   0.000
                             pm25_lag_9_day |      0.527      0.141
3.747   0.000
                            pm25_lag_10_day |     -1.892      0.141
-13.434   0.000
                            pm25_lag_11_day |      0.251      0.125
2.002   0.045
                            pm25_lag_12_day |     -0.399      0.125
-3.185   0.001
                             temp_daily_avg |     47.496      6.069
7.825   0.000
                           precip_daily_avg |   4308.876    340.211
12.665   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -7.378      0.569
-12.965   0.000
                                            |
                           relhum_daily_avg |      2.386      3.034
0.786   0.432
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.020      0.005
3.890   0.000
                                            |
                            press_daily_avg |      7.296      2.192
3.329   0.001
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.468      0.059
-7.944   0.000
                                            |
                      winddir_cos_daily_avg |   -191.570     22.229
```

```
-8.618   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.237      0.023
10.122   0.000
                                                |
                      winddir_sin_daily_avg |    281.306     23.827
11.806   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.535      0.025
-21.086   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.415      0.320
1.298   0.194
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -43.172      3.282
-13.154   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.448      0.457
-5.359   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      4.793      0.980
4.892   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.026      0.030
-0.873   0.382
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.015      0.012
-1.266   0.206
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.159      0.014
-11.475   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      1.940      0.216
8.996   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.704      0.231
-11.686   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
```

```
* = FE nested within cluster; treated as redundant for DoF computation
(est3 stored)
.         estadd scalar maxlag = 12

added scalar:
            e(maxlag) =  12
.
.         lincom pm25_pref

 ( 1)  pm25_pref = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -1.225809   .1418002    -8.64   0.000    -1.503733
-.947886
------------------------------------------------------------------------
--------
.         estadd scalar imp_b = r(estimate)

added scalar:
              e(imp_b) =  -1.2258094
.         estadd scalar imp_s = r(se)

added scalar:
              e(imp_s) =  .14180015
.         estadd scalar imp_t = r(estimate) /r(se)

added scalar:
              e(imp_t) =  -8.6446268
.
.         lincom
pm25_pref+pm25_lag_1_day+pm25_lag_2_day+pm25_lag_3_day+pm25_lag_4_day+
pm25_lag_5_day+pm25_lag_6_day+pm25_lag_7_d
>
ay+pm25_lag_8_day+pm25_lag_9_day+pm25_lag_10_day+pm25_lag_11_day+pm25_
lag_12_day

 ( 1)  pm25_pref + pm25_lag_1_day + pm25_lag_2_day + pm25_lag_3_day +
pm25_lag_4_day + pm25_lag_5_day + pm25_lag_6_day +
       pm25_lag_7_day + pm25_lag_8_day + pm25_lag_9_day +
pm25_lag_10_day + pm25_lag_11_day + pm25_lag_12_day = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
```

```
-------------
+------------------------------------------------------------------
         (1) |  -8.674792   .4933731   -17.58   0.000    -9.641787
-7.707798
-------------------------------------------------------------------
--------

. 	estadd scalar cum_b = r(estimate)

added scalar:
              e(cum_b) =  -8.6747923
. 	estadd scalar cum_s = r(se)

added scalar:
              e(cum_s) =  .49337311
. 	estadd scalar cum_t = r(estimate) /r(se)

added scalar:
              e(cum_t) =  -17.582621
.
. 	eststo : reghdfe percent pm25_pref pm25_lag_1_day-
pm25_lag_11_day `controls2' , absorb(`absorb1') vce(clust `cluster')
> `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
```

```
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  32,   1025) =
74.76
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4610
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0014
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0452

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------+----------------------------------
                                  pm25_pref |     -1.174      0.141
-8.328   0.000
                             pm25_lag_1_day |     -0.383      0.142
-2.704   0.007
                             pm25_lag_2_day |     -1.277      0.132
-9.688   0.000
                             pm25_lag_3_day |     -0.594      0.134
-4.421   0.000
                             pm25_lag_4_day |     -0.520      0.135
-3.841   0.000
                             pm25_lag_5_day |     -0.522      0.133
-3.920   0.000
                             pm25_lag_6_day |     -1.493      0.134
-11.104   0.000
                             pm25_lag_7_day |      0.170      0.142
1.202   0.229
                             pm25_lag_8_day |     -1.014      0.142
-7.133   0.000
                             pm25_lag_9_day |      0.498      0.140
```

```
3.550   0.000
                          pm25_lag_10_day |     -1.779      0.136
-13.080   0.000
                          pm25_lag_11_day |      0.143      0.121
1.176   0.240
                           temp_daily_avg |     44.889      6.006
7.474   0.000
                         precip_daily_avg |   4394.097    339.300
12.950   0.000
                                          |
       c.temp_daily_avg#c.precip_daily_avg |     -7.137      0.564
-12.651   0.000
                                          |
                         relhum_daily_avg |      2.744      3.032
0.905   0.365
                                          |
       c.temp_daily_avg#c.relhum_daily_avg |      0.021      0.005
4.157   0.000
                                          |
                          press_daily_avg |      7.361      2.191
3.359   0.001
                                          |
        c.temp_daily_avg#c.press_daily_avg |     -0.443      0.058
-7.599   0.000
                                          |
                     winddir_cos_daily_avg |   -189.178     22.220
-8.514   0.000
                                          |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.240      0.023
10.237   0.000
                                          |
                     winddir_sin_daily_avg |    277.522     23.799
11.661   0.000
                                          |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.531      0.025
-20.952   0.000
                                          |
     c.precip_daily_avg#c.relhum_daily_avg |      0.351      0.319
1.101   0.271
                                          |
      c.precip_daily_avg#c.press_daily_avg |    -43.989      3.273
-13.438   0.000
                                          |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.643      0.452
-5.843   0.000
                                          |
c.precip_daily_avg#c.winddir_sin_daily_avg |      4.811      0.980
4.910   0.000
                                          |
      c.relhum_daily_avg#c.press_daily_avg |     -0.030      0.030
```

```
-0.995   0.320
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.014      0.012
-1.183   0.237
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.157      0.014
-11.303   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      1.916      0.216
8.888   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.668      0.231
-11.543   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est4 stored)
.         estadd scalar maxlag = 11

added scalar:
             e(maxlag) =  11
.
.         lincom pm25_pref

 ( 1)  pm25_pref = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -1.173718   .1409345    -8.33   0.000    -1.449945
-.8974913
------------------------------------------------------------------------------
--------
.         estadd scalar imp_b = r(estimate)

added scalar:
```

```
              e(imp_b) =  -1.173718
.         estadd scalar imp_s = r(se)

added scalar:
              e(imp_s) =  .14093447
.         estadd scalar imp_t = r(estimate) /r(se)

added scalar:
              e(imp_t) =  -8.3281112
.
.         lincom
pm25_pref+pm25_lag_1_day+pm25_lag_2_day+pm25_lag_3_day+pm25_lag_4_day+
pm25_lag_5_day+pm25_lag_6_day+pm25_lag_7_d
> ay+pm25_lag_8_day+pm25_lag_9_day+pm25_lag_10_day+pm25_lag_11_day

 ( 1)  pm25_pref + pm25_lag_1_day + pm25_lag_2_day + pm25_lag_3_day +
pm25_lag_4_day + pm25_lag_5_day + pm25_lag_6_day +
       pm25_lag_7_day + pm25_lag_8_day + pm25_lag_9_day +
pm25_lag_10_day + pm25_lag_11_day = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -7.943394   .4321449   -18.38   0.000    -8.790383
-7.096405
------------------------------------------------------------------------
--------
.         estadd scalar cum_b = r(estimate)

added scalar:
              e(cum_b) =  -7.9433938
.         estadd scalar cum_s = r(se)

added scalar:
              e(cum_s) =  .43214489
.         estadd scalar cum_t = r(estimate) /r(se)

added scalar:
              e(cum_t) =  -18.38132
.
.         eststo : reghdfe percent pm25_pref pm25_lag_1_day-
pm25_lag_10_day `controls2' , absorb(`absorb1') vce(clust `cluster')
> `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  31,   1025) =
77.09
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4610
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0014
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0453

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
```

```
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                  pm25_pref |     -1.201      0.139
-8.657   0.000
                              pm25_lag_1_day |     -0.389      0.142
-2.748   0.006
                              pm25_lag_2_day |     -1.291      0.131
-9.841   0.000
                              pm25_lag_3_day |     -0.606      0.134
-4.522   0.000
                              pm25_lag_4_day |     -0.538      0.134
-4.003   0.000
                              pm25_lag_5_day |     -0.530      0.133
-3.987   0.000
                              pm25_lag_6_day |     -1.488      0.134
-11.065   0.000
                              pm25_lag_7_day |      0.130      0.138
0.943   0.346
                              pm25_lag_8_day |     -1.003      0.142
-7.076   0.000
                              pm25_lag_9_day |      0.462      0.137
3.374   0.001
                             pm25_lag_10_day |     -1.733      0.131
-13.265   0.000
                              temp_daily_avg |     45.259      5.995
7.549   0.000
                            precip_daily_avg |   4379.630    338.906
12.923   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -7.193      0.562
-12.802   0.000
                                            |
                            relhum_daily_avg |      2.639      3.032
0.870   0.384
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.022      0.005
4.255   0.000
                                            |
                             press_daily_avg |      7.318      2.191
3.339   0.001
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.447      0.058
-7.682   0.000
                                            |
                       winddir_cos_daily_avg |   -189.423     22.222
-8.524   0.000
                                            |
```

```
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.237      0.023
10.168   0.000
                                           |
                      winddir_sin_daily_avg |    277.212     23.795
11.650   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.530      0.025
-20.935   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.351      0.319
1.099   0.272
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -43.837      3.269
-13.410   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.605      0.452
-5.769   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      4.866      0.979
4.970   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.029      0.030
-0.961   0.336
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.014      0.012
-1.181   0.238
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.156      0.014
-11.285   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      1.919      0.216
8.898   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.665      0.231
-11.532   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est5 stored)
```

```
.         estadd scalar maxlag = 10

added scalar:
             e(maxlag) =  10
.
.         lincom pm25_pref

 ( 1)  pm25_pref = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |   -1.20069   .1386962    -8.66   0.000     -1.47253
-.9288506
------------------------------------------------------------------------------
.         estadd scalar imp_b = r(estimate)

added scalar:
              e(imp_b) =  -1.2006904
.         estadd scalar imp_s = r(se)

added scalar:
              e(imp_s) =  .13869621
.         estadd scalar imp_t = r(estimate) /r(se)

added scalar:
              e(imp_t) =  -8.6569808
.
.         lincom
pm25_pref+pm25_lag_1_day+pm25_lag_2_day+pm25_lag_3_day+pm25_lag_4_day+
pm25_lag_5_day+pm25_lag_6_day+pm25_lag_7_d
> ay+pm25_lag_8_day+pm25_lag_9_day+pm25_lag_10_day

 ( 1)  pm25_pref + pm25_lag_1_day + pm25_lag_2_day + pm25_lag_3_day +
pm25_lag_4_day + pm25_lag_5_day + pm25_lag_6_day +
       pm25_lag_7_day + pm25_lag_8_day + pm25_lag_9_day +
pm25_lag_10_day = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -8.187001   .3772317   -21.70   0.000    -8.926362
-7.44764
```

```
------------------------------------------------------------------------
--------
.         estadd scalar cum_b = r(estimate)

added scalar:
              e(cum_b) =  -8.1870013
.         estadd scalar cum_s = r(se)

added scalar:
              e(cum_s) =  .37723174
.         estadd scalar cum_t = r(estimate) /r(se)

added scalar:
              e(cum_t) =  -21.702844
.
.         eststo : reghdfe percent pm25_pref pm25_lag_1_day-
pm25_lag_9_day `controls2' , absorb(`absorb1') vce(clust `cluster') `
> display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
```

```
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  30,   1025) =
73.61
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0681

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                           |               Robust
                                   percent | Coefficient  std. err.
t    P>|t|
-----------------------------------------
+----------------------------------------
                                 pm25_pref |     -1.035      0.138
-7.484   0.000
                            pm25_lag_1_day |     -0.194      0.141
-1.376   0.169
                            pm25_lag_2_day |     -1.359      0.131
-10.373   0.000
                            pm25_lag_3_day |     -0.361      0.133
-2.721   0.007
                            pm25_lag_4_day |     -0.494      0.134
-3.677   0.000
                            pm25_lag_5_day |     -0.576      0.133
-4.338   0.000
                            pm25_lag_6_day |     -1.107      0.131
-8.437   0.000
                            pm25_lag_7_day |     -0.024      0.137
-0.176   0.861
                            pm25_lag_8_day |     -0.663      0.139
-4.772   0.000
                            pm25_lag_9_day |     -0.239      0.126
-1.904   0.057
                            temp_daily_avg |     48.725      5.986
8.140   0.000
                          precip_daily_avg |   4177.847    338.658
```

```
12.336   0.000
                                                 |
       c.temp_daily_avg#c.precip_daily_avg |     -6.537      0.560
-11.665   0.000
                                                 |
                           relhum_daily_avg |      6.097      3.024
2.016   0.044
                                                 |
       c.temp_daily_avg#c.relhum_daily_avg |      0.019      0.005
3.676   0.000
                                                 |
                            press_daily_avg |      9.951      2.184
4.557   0.000
                                                 |
        c.temp_daily_avg#c.press_daily_avg |     -0.481      0.058
-8.280   0.000
                                                 |
                       winddir_cos_daily_avg |   -197.305     22.211
-8.883   0.000
                                                 |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.268      0.023
11.576   0.000
                                                 |
                       winddir_sin_daily_avg |    267.829     23.779
11.263   0.000
                                                 |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.526      0.025
-20.772   0.000
                                                 |
     c.precip_daily_avg#c.relhum_daily_avg |      0.373      0.319
1.167   0.243
                                                 |
      c.precip_daily_avg#c.press_daily_avg |    -41.855      3.267
-12.813   0.000
                                                 |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.876      0.451
-6.376   0.000
                                                 |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.135      0.974
6.301   0.000
                                                 |
      c.relhum_daily_avg#c.press_daily_avg |     -0.063      0.030
-2.093   0.036
                                                 |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.009      0.012
-0.801   0.423
                                                 |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.169      0.014
-12.258   0.000
                                                 |
```

```
 c.press_daily_avg#c.winddir_cos_daily_avg |      1.992      0.216
9.243   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.563      0.231
-11.101   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est6 stored)
.         estadd scalar maxlag = 9

added scalar:
             e(maxlag) =  9
.
.         lincom pm25_pref

 ( 1)  pm25_pref = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -1.034501   .1382284    -7.48   0.000    -1.305424
-.7635784
------------------------------------------------------------------------------
--------
.         estadd scalar imp_b = r(estimate)

added scalar:
              e(imp_b) =  -1.0345013
.         estadd scalar imp_s = r(se)

added scalar:
              e(imp_s) =  .13822842
.         estadd scalar imp_t = r(estimate) /r(se)

added scalar:
```

```
              e(imp_t) =  -7.4839987
.
.         lincom
pm25_pref+pm25_lag_1_day+pm25_lag_2_day+pm25_lag_3_day+pm25_lag_4_day+
pm25_lag_5_day+pm25_lag_6_day+pm25_lag_7_d
> ay+pm25_lag_8_day+pm25_lag_9_day

 ( 1)  pm25_pref + pm25_lag_1_day + pm25_lag_2_day + pm25_lag_3_day +
pm25_lag_4_day + pm25_lag_5_day + pm25_lag_6_day +
       pm25_lag_7_day + pm25_lag_8_day + pm25_lag_9_day = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -6.052625   .3414736   -17.73   0.000    -6.721901
-5.383348
------------------------------------------------------------------------
--------
.         estadd scalar cum_b = r(estimate)

added scalar:
              e(cum_b) =  -6.0526246
.         estadd scalar cum_s = r(se)

added scalar:
              e(cum_s) =  .34147364
.         estadd scalar cum_t = r(estimate) /r(se)

added scalar:
              e(cum_t) =  -17.725013
.
.         eststo : reghdfe percent pm25_pref pm25_lag_1_day-
pm25_lag_8_day `controls2' , absorb(`absorb1') vce(clust `cluster') `
> display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
```

```
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  29,   1025) =
76.02
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0685

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                           |               Robust
                                   percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+----------------------------------------
                                 pm25_pref |     -1.039      0.138
-7.520   0.000
                            pm25_lag_1_day |     -0.217      0.140
-1.545   0.122
```

```
                          pm25_lag_2_day |     -1.325      0.130
-10.222   0.000
                          pm25_lag_3_day |     -0.354      0.133
-2.668   0.008
                          pm25_lag_4_day |     -0.507      0.134
-3.776   0.000
                          pm25_lag_5_day |     -0.533      0.131
-4.055   0.000
                          pm25_lag_6_day |     -1.137      0.131
-8.704   0.000
                          pm25_lag_7_day |      0.036      0.134
0.270   0.787
                          pm25_lag_8_day |     -0.766      0.129
-5.962   0.000
                          temp_daily_avg |     50.141      5.939
8.443   0.000
                         precip_daily_avg |   4135.230    337.936
12.237   0.000
                                          |
       c.temp_daily_avg#c.precip_daily_avg |     -6.555      0.560
-11.699   0.000
                                          |
                         relhum_daily_avg |      5.905      3.023
1.953   0.051
                                          |
       c.temp_daily_avg#c.relhum_daily_avg |      0.018      0.005
3.516   0.000
                                          |
                          press_daily_avg |      9.863      2.183
4.517   0.000
                                          |
        c.temp_daily_avg#c.press_daily_avg |     -0.495      0.058
-8.574   0.000
                                          |
                      winddir_cos_daily_avg |   -201.223     22.114
-9.099   0.000
                                          |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.270      0.023
11.667   0.000
                                          |
                      winddir_sin_daily_avg |    268.074     23.779
11.274   0.000
                                          |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.525      0.025
-20.729   0.000
                                          |
     c.precip_daily_avg#c.relhum_daily_avg |      0.431      0.318
1.355   0.175
                                          |
      c.precip_daily_avg#c.press_daily_avg |    -41.471      3.260
```

```
-12.719   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.831      0.451
-6.284   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.128      0.974
6.295   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.061      0.030
-2.027   0.043
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.009      0.011
-0.750   0.453
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.169      0.014
-12.244   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.031      0.215
9.465   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.566      0.231
-11.112   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est7 stored)
.         estadd scalar maxlag = 8

added scalar:
             e(maxlag) =  8
.
.         lincom pm25_pref

 ( 1)  pm25_pref = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
```

```
-------------
+------------------------------------------------------------------
         (1) |  -1.039475     .13823    -7.52   0.000    -1.310401
-.7685495
------------------------------------------------------------------------
--------
.         estadd scalar imp_b = r(estimate)

added scalar:
              e(imp_b) =  -1.0394755
.         estadd scalar imp_s = r(se)

added scalar:
              e(imp_s) =  .13822998
.         estadd scalar imp_t = r(estimate) /r(se)

added scalar:
              e(imp_t) =  -7.5198992
.
.         lincom
pm25_pref+pm25_lag_1_day+pm25_lag_2_day+pm25_lag_3_day+pm25_lag_4_day+
pm25_lag_5_day+pm25_lag_6_day+pm25_lag_7_d
> ay+pm25_lag_8_day

 ( 1)  pm25_pref + pm25_lag_1_day + pm25_lag_2_day + pm25_lag_3_day +
pm25_lag_4_day + pm25_lag_5_day + pm25_lag_6_day +
       pm25_lag_7_day + pm25_lag_8_day = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+------------------------------------------------------------------
         (1) |  -5.842959   .3235497   -18.06   0.000    -6.477105
-5.208813
------------------------------------------------------------------------
--------
.         estadd scalar cum_b = r(estimate)

added scalar:
              e(cum_b) =  -5.8429586
.         estadd scalar cum_s = r(se)

added scalar:
              e(cum_s) =  .32354966
.         estadd scalar cum_t = r(estimate) /r(se)

added scalar:
              e(cum_t) =  -18.058924
```

```
.
.         eststo : reghdfe percent pm25_pref pm25_lag_1_day-
pm25_lag_7_day `controls2' , absorb(`absorb1') vce(clust `cluster') `
> display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  28,   1025) =
77.56
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
```

```
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0729

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-------------------------------------
                                  pm25_pref |     -1.139      0.137
-8.297   0.000
                            pm25_lag_1_day |     -0.124      0.139
-0.892   0.372
                            pm25_lag_2_day |     -1.284      0.130
-9.918   0.000
                            pm25_lag_3_day |     -0.382      0.133
-2.877   0.004
                            pm25_lag_4_day |     -0.379      0.133
-2.856   0.004
                            pm25_lag_5_day |     -0.596      0.131
-4.547   0.000
                            pm25_lag_6_day |     -0.975      0.128
-7.598   0.000
                            pm25_lag_7_day |     -0.284      0.124
-2.298   0.022
                            temp_daily_avg |     50.953      5.936
8.583   0.000
                          precip_daily_avg |   4157.434    337.902
12.304   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.958      0.556
-12.522   0.000
                                            |
                          relhum_daily_avg |      4.014      3.008
1.334   0.182
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.016      0.005
3.116   0.002
                                            |
                           press_daily_avg |      9.176      2.181
4.208   0.000
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.501      0.058
-8.686   0.000
                                            |
                     winddir_cos_daily_avg |   -213.938     22.037
```

```
-9.708   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.264      0.023
11.450   0.000
                                                |
                      winddir_sin_daily_avg |    264.839     23.773
11.140   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.521      0.025
-20.592   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.254      0.316
0.803   0.422
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -41.525      3.260
-12.737   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.765      0.450
-6.139   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.771      0.967
7.001   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.042      0.030
-1.399   0.162
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.007      0.011
-0.601   0.548
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.169      0.014
-12.231   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.157      0.214
10.089   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.535      0.231
-10.982   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
```

```
* = FE nested within cluster; treated as redundant for DoF computation
(est8 stored)
.         estadd scalar maxlag = 7

added scalar:
            e(maxlag) =  7
.
.         lincom pm25_pref

 ( 1)  pm25_pref = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -1.138815   .1372505    -8.30   0.000    -1.407822
-.8698092
------------------------------------------------------------------------
--------
.         estadd scalar imp_b = r(estimate)

added scalar:
              e(imp_b) =  -1.1388155
.         estadd scalar imp_s = r(se)

added scalar:
              e(imp_s) =  .13725054
.         estadd scalar imp_t = r(estimate) /r(se)

added scalar:
              e(imp_t) =  -8.2973479
.
.         lincom
pm25_pref+pm25_lag_1_day+pm25_lag_2_day+pm25_lag_3_day+pm25_lag_4_day+
pm25_lag_5_day+pm25_lag_6_day+pm25_lag_7_d
> ay

 ( 1)  pm25_pref + pm25_lag_1_day + pm25_lag_2_day + pm25_lag_3_day +
pm25_lag_4_day + pm25_lag_5_day + pm25_lag_6_day +
       pm25_lag_7_day = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -5.163756   .3029946   -17.04   0.000    -5.757615
```

```
-4.569897
------------------------------------------------------------------------------
--------
.         estadd scalar cum_b = r(estimate)

added scalar:
              e(cum_b) =  -5.1637556
.         estadd scalar cum_s = r(se)

added scalar:
              e(cum_s) =  .30299459
.         estadd scalar cum_t = r(estimate) /r(se)

added scalar:
              e(cum_t) =  -17.042402
.
.         eststo : reghdfe percent pm25_pref pm25_lag_1_day-
pm25_lag_6_day `controls2' , absorb(`absorb1') vce(clust `cluster') `
> display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
```

```
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  27,   1025) =
80.24
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0735

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                             |               Robust
                                     percent | Coefficient  std. err.
t    P>|t|
--------------------------------------------
+-----------------------------------------
                                   pm25_pref |     -1.102      0.137
-8.074   0.000
                             pm25_lag_1_day |     -0.078      0.138
-0.565   0.572
                             pm25_lag_2_day |     -1.307      0.129
-10.132   0.000
                             pm25_lag_3_day |     -0.308      0.129
-2.392   0.017
                             pm25_lag_4_day |     -0.426      0.131
-3.251   0.001
                             pm25_lag_5_day |     -0.516      0.126
-4.087   0.000
                             pm25_lag_6_day |     -1.097      0.116
-9.483   0.000
                             temp_daily_avg |     52.219      5.920
8.821   0.000
                           precip_daily_avg |   4133.490    337.789
12.237   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -7.014      0.555
-12.634   0.000
                                             |
```

```
                          relhum_daily_avg |      4.460      3.005
1.484   0.138
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.015      0.005
3.068   0.002
                                           |
                           press_daily_avg |      9.447      2.180
4.334   0.000
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.514      0.058
-8.927   0.000
                                           |
                       winddir_cos_daily_avg |   -211.940     22.014
-9.627   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.266      0.023
11.506   0.000
                                           |
                       winddir_sin_daily_avg |    261.113     23.708
11.014   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.519      0.025
-20.541   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.273      0.316
0.864   0.388
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -41.298      3.259
-12.671   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.796      0.450
-6.209   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.976      0.964
7.239   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.046      0.030
-1.552   0.121
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.005      0.011
-0.460   0.646
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.169      0.014
-12.205   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.136      0.214
10.002   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.499      0.230
-10.854   0.000
```

```
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est9 stored)
.         estadd scalar maxlag = 6

added scalar:
             e(maxlag) =  6
.
.         lincom pm25_pref

 ( 1)  pm25_pref = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -1.102387   .1365297    -8.07   0.000     -1.36998
-.8347931
------------------------------------------------------------------------------
--------
.         estadd scalar imp_b = r(estimate)

added scalar:
              e(imp_b) =  -1.1023866
.         estadd scalar imp_s = r(se)

added scalar:
              e(imp_s) =  .13652969
.         estadd scalar imp_t = r(estimate) /r(se)

added scalar:
              e(imp_t) =  -8.0743362
.
.         lincom
pm25_pref+pm25_lag_1_day+pm25_lag_2_day+pm25_lag_3_day+pm25_lag_4_day+
pm25_lag_5_day+pm25_lag_6_day
```

```
 ( 1)  pm25_pref + pm25_lag_1_day + pm25_lag_2_day + pm25_lag_3_day +
pm25_lag_4_day + pm25_lag_5_day + pm25_lag_6_day = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -4.834712   .2713524   -17.82   0.000    -5.366554
-4.302871
------------------------------------------------------------------------
--------
.         estadd scalar cum_b = r(estimate)

added scalar:
              e(cum_b) =  -4.8347121
.         estadd scalar cum_s = r(se)

added scalar:
              e(cum_s) =  .27135242
.         estadd scalar cum_t = r(estimate) /r(se)

added scalar:
              e(cum_t) =  -17.817096
.
.         eststo : reghdfe percent pm25_pref pm25_lag_1_day-
pm25_lag_5_day `controls2' , absorb(`absorb1') vce(clust `cluster') `
> display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
```

```
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  26,   1025) =
79.64
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,957         Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0853

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                           |               Robust
                                   percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                 pm25_pref |     -0.899      0.135
-6.669   0.000
                            pm25_lag_1_day |     -0.164      0.138
-1.190   0.234
                            pm25_lag_2_day |     -1.015      0.126
-8.064   0.000
                            pm25_lag_3_day |     -0.524      0.127
-4.134   0.000
                            pm25_lag_4_day |     -0.125      0.127
-0.984   0.325
                            pm25_lag_5_day |     -0.987      0.117
```

```
-8.466   0.000
                            temp_daily_avg |     56.964      5.899
9.656   0.000
                          precip_daily_avg |   4036.066    337.626
11.954   0.000
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -7.018      0.555
-12.641   0.000
                                           |
                          relhum_daily_avg |      4.977      3.005
1.657   0.098
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.016      0.005
3.259   0.001
                                           |
                           press_daily_avg |     10.101      2.179
4.636   0.000
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.562      0.057
-9.804   0.000
                                           |
                      winddir_cos_daily_avg |   -216.295     22.013
-9.826   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.259      0.023
11.208   0.000
                                           |
                      winddir_sin_daily_avg |    264.813     23.705
11.171   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.509      0.025
-20.141   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.303      0.316
0.958   0.338
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -40.313      3.258
-12.375   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.316      0.447
-5.183   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.903      0.963
7.164   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.052      0.030
-1.736   0.083
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.011      0.011
-0.999   0.318
```

```
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.168      0.014
-12.176   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.182      0.214
10.217   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.537      0.230
-11.020   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est10 stored)
.         estadd scalar maxlag = 5

added scalar:
             e(maxlag) =  5
.
.         lincom pm25_pref

 ( 1)  pm25_pref = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.8990949   .1348113    -6.67   0.000     -1.16332
-.6348694
------------------------------------------------------------------------------
--------
.         estadd scalar imp_b = r(estimate)

added scalar:
              e(imp_b) =  -.89909494
.         estadd scalar imp_s = r(se)

added scalar:
```

```
              e(imp_s) =  .13481134
.         estadd scalar imp_t = r(estimate) /r(se)

added scalar:
              e(imp_t) =  -6.6692826
.
.         lincom
pm25_pref+pm25_lag_1_day+pm25_lag_2_day+pm25_lag_3_day+pm25_lag_4_day+
pm25_lag_5_day

 ( 1)  pm25_pref + pm25_lag_1_day + pm25_lag_2_day + pm25_lag_3_day +
pm25_lag_4_day + pm25_lag_5_day = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |   -3.71413   .2453157   -15.14   0.000    -4.194941
-3.23332
------------------------------------------------------------------------
--------
.         estadd scalar cum_b = r(estimate)

added scalar:
              e(cum_b) =  -3.7141304
.         estadd scalar cum_s = r(se)

added scalar:
              e(cum_s) =  .24531566
.         estadd scalar cum_t = r(estimate) /r(se)

added scalar:
              e(cum_t) =  -15.140209
.
.         eststo : reghdfe percent pm25_pref pm25_lag_1_day-
pm25_lag_4_day `controls2' , absorb(`absorb1') vce(clust `cluster') `
> display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
```

```
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  25,   1025) =
80.00
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,957         Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0945

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                          |               Robust
                                  percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                pm25_pref |     -0.998      0.134
-7.423   0.000
```

```
                            pm25_lag_1_day |      0.146      0.132
1.107   0.269
                            pm25_lag_2_day |     -1.246      0.123
-10.163   0.000
                            pm25_lag_3_day |     -0.256      0.123
-2.082   0.037
                            pm25_lag_4_day |     -0.602      0.114
-5.284   0.000
                            temp_daily_avg |     55.071      5.895
9.342   0.000
                           precip_daily_avg |   4043.623    337.618
11.977   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.616      0.553
-11.957   0.000
                                            |
                           relhum_daily_avg |      3.959      3.002
1.319   0.187
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.016      0.005
3.096   0.002
                                            |
                            press_daily_avg |      9.938      2.179
4.561   0.000
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.543      0.057
-9.487   0.000
                                            |
                       winddir_cos_daily_avg |   -229.405     21.968
-10.443   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.263      0.023
11.397   0.000
                                            |
                       winddir_sin_daily_avg |    274.826     23.682
11.605   0.000
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.524      0.025
-20.781   0.000
                                            |
     c.precip_daily_avg#c.relhum_daily_avg |      0.461      0.316
1.461   0.144
                                            |
      c.precip_daily_avg#c.press_daily_avg |    -40.530      3.258
-12.442   0.000
                                            |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.767      0.442
-3.996   0.000
                                            |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.309      0.962
```

```
7.595   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.042      0.030
-1.399   0.162
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.010      0.011
-0.871   0.384
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.180      0.014
-13.098   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.310      0.213
10.842   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.628      0.230
-11.425   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est11 stored)
.         estadd scalar maxlag = 4

added scalar:
             e(maxlag) =  4
.
.         lincom pm25_pref

 ( 1)  pm25_pref = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.9976974   .1344049    -7.42   0.000    -1.261126
-.7342684
------------------------------------------------------------------------------
--------
```

```
.         estadd scalar imp_b = r(estimate)

added scalar:
              e(imp_b) =  -.99769739
.         estadd scalar imp_s = r(se)

added scalar:
              e(imp_s) =  .13440494
.         estadd scalar imp_t = r(estimate) /r(se)

added scalar:
              e(imp_t) =  -7.423071
.
.         lincom
pm25_pref+pm25_lag_1_day+pm25_lag_2_day+pm25_lag_3_day+pm25_lag_4_day

 ( 1)  pm25_pref + pm25_lag_1_day + pm25_lag_2_day + pm25_lag_3_day +
pm25_lag_4_day = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -2.955876   .2281641   -12.96   0.000    -3.403069
-2.508682
------------------------------------------------------------------------
--------
.         estadd scalar cum_b = r(estimate)

added scalar:
              e(cum_b) =  -2.9558756
.         estadd scalar cum_s = r(se)

added scalar:
              e(cum_s) =  .22816412
.         estadd scalar cum_t = r(estimate) /r(se)

added scalar:
              e(cum_t) =  -12.955042
.
.         eststo : reghdfe percent pm25_pref pm25_lag_1_day-
pm25_lag_3_day `controls2' , absorb(`absorb1') vce(clust `cluster') `
> display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  24,   1025) =
82.18
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,957         Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0979

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                                  |               Robust
```

```
                                      percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------
                                   pm25_pref |     -0.839      0.131
-6.411   0.000
                               pm25_lag_1_day |      0.056      0.131
0.425   0.671
                               pm25_lag_2_day |     -1.101      0.120
-9.205   0.000
                               pm25_lag_3_day |     -0.514      0.113
-4.542   0.000
                               temp_daily_avg |     54.110      5.894
9.180   0.000
                              precip_daily_avg |   4305.115    333.493
12.909   0.000
                                               |
       c.temp_daily_avg#c.precip_daily_avg |     -6.783      0.552
-12.285   0.000
                                               |
                             relhum_daily_avg |      3.558      3.002
1.185   0.236
                                               |
       c.temp_daily_avg#c.relhum_daily_avg |      0.017      0.005
3.430   0.001
                                               |
                              press_daily_avg |      9.540      2.178
4.381   0.000
                                               |
        c.temp_daily_avg#c.press_daily_avg |     -0.535      0.057
-9.345   0.000
                                               |
                         winddir_cos_daily_avg |   -225.769     21.956
-10.283   0.000
                                               |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.269      0.023
11.712   0.000
                                               |
                         winddir_sin_daily_avg |    264.564     23.592
11.214   0.000
                                               |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.518      0.025
-20.566   0.000
                                               |
     c.precip_daily_avg#c.relhum_daily_avg |      0.308      0.314
0.979   0.327
                                               |
      c.precip_daily_avg#c.press_daily_avg |    -43.028      3.219
-13.369   0.000
                                               |
```

```
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.730      0.442
-3.915   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.451      0.961
7.749   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.038      0.030
-1.266   0.206
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.008      0.011
-0.725   0.469
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.170      0.014
-12.483   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.272      0.213
10.671   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.532      0.229
-11.049   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est12 stored)
.         estadd scalar maxlag = 3

added scalar:
             e(maxlag) =  3
.
.         lincom pm25_pref

 ( 1)  pm25_pref = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+-------------------------------------------------------------
```

```
         (1) |  -.8394864   .1309505    -6.41   0.000    -1.096145
-.582828
------------------------------------------------------------------------------
--------
.         estadd scalar imp_b = r(estimate)

added scalar:
              e(imp_b) =  -.83948642
.         estadd scalar imp_s = r(se)

added scalar:
              e(imp_s) =  .13095048
.         estadd scalar imp_t = r(estimate) /r(se)

added scalar:
              e(imp_t) =  -6.4107165
.
.         lincom
pm25_pref+pm25_lag_1_day+pm25_lag_2_day+pm25_lag_3_day

 ( 1)  pm25_pref + pm25_lag_1_day + pm25_lag_2_day + pm25_lag_3_day =
0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -2.398506   .2022619   -11.86   0.000    -2.794932
-2.002079
------------------------------------------------------------------------------
--------
.         estadd scalar cum_b = r(estimate)

added scalar:
              e(cum_b) =  -2.3985058
.         estadd scalar cum_s = r(se)

added scalar:
              e(cum_s) =  .20226193
.         estadd scalar cum_t = r(estimate) /r(se)

added scalar:
              e(cum_t) =  -11.858414
.
.         eststo : reghdfe percent pm25_pref pm25_lag_1_day-
pm25_lag_2_day `controls2' , absorb(`absorb1') vce(clust `cluster') `
> display_options'
(dropped 1175 singleton observations)
```

```
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
84.84
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,957         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1005

                      (Std. err. adjusted for 1,026 clusters in
```

```
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                                |               Robust
                                        percent | Coefficient  std. err.
t    P>|t|
-----------------------------------------------
+-----------------------------------------
                                     pm25_pref |     -0.863      0.131
-6.589   0.000
                                 pm25_lag_1_day |      0.185      0.128
1.443   0.149
                                 pm25_lag_2_day |     -1.323      0.110
-12.044   0.000
                                 temp_daily_avg |     55.639      5.886
9.453   0.000
                                precip_daily_avg |   4324.704    333.459
12.969   0.000
                                                |
       c.temp_daily_avg#c.precip_daily_avg |     -6.756      0.552
-12.237   0.000
                                                |
                               relhum_daily_avg |      3.510      3.002
1.169   0.242
                                                |
       c.temp_daily_avg#c.relhum_daily_avg |      0.015      0.005
2.965   0.003
                                                |
                                press_daily_avg |      9.393      2.178
4.314   0.000
                                                |
        c.temp_daily_avg#c.press_daily_avg |     -0.549      0.057
-9.602   0.000
                                                |
                        winddir_cos_daily_avg |   -229.090     21.948
-10.438   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.269      0.023
11.682   0.000
                                                |
                        winddir_sin_daily_avg |    259.027     23.571
10.989   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.513      0.025
-20.391   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.291      0.314
0.926   0.354
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -43.220      3.218
```

```
-13.430   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.779      0.442
-4.027   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.472      0.961
7.771   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.037      0.030
-1.245   0.213
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.355   0.723
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.166      0.014
-12.184   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.303      0.213
10.817   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.480      0.229
-10.830   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est13 stored)
.         estadd scalar maxlag = 2

added scalar:
             e(maxlag) =  2
.
.         lincom pm25_pref

 ( 1)  pm25_pref = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
```

```
-------------
+------------------------------------------------------------------
         (1) |   -.862588   .1309057    -6.59   0.000    -1.119159
-.6060175
-------------------------------------------------------------------
--------
.         estadd scalar imp_b = r(estimate)

added scalar:
              e(imp_b) =  -.86258803
.         estadd scalar imp_s = r(se)

added scalar:
              e(imp_s) =  .13090567
.         estadd scalar imp_t = r(estimate) /r(se)

added scalar:
              e(imp_t) =  -6.5893864
.
.         lincom pm25_pref+pm25_lag_1_day+pm25_lag_2_day

 ( 1)  pm25_pref + pm25_lag_1_day + pm25_lag_2_day = 0

-------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+------------------------------------------------------------------
         (1) |  -2.000378   .1813246   -11.03   0.000    -2.355768
-1.644988
-------------------------------------------------------------------
--------
.         estadd scalar cum_b = r(estimate)

added scalar:
              e(cum_b) =  -2.0003779
.         estadd scalar cum_s = r(se)

added scalar:
              e(cum_s) =  .18132464
.         estadd scalar cum_t = r(estimate) /r(se)

added scalar:
              e(cum_t) =  -11.032025
.
.         eststo : reghdfe percent pm25_pref pm25_lag_1_day-
pm25_lag_1_day `controls2' , absorb(`absorb1') vce(clust `cluster') `
> display_options'
(dropped 1175 singleton observations)
```

```
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  22,   1025) =
81.88
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,957         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1193

                      (Std. err. adjusted for 1,026 clusters in
```

```
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                                |               Robust
                                        percent | Coefficient  std. err.
t    P>|t|
-----------------------------------------------
+-----------------------------------------
                                     pm25_pref |     -0.524      0.128
-4.101   0.000
                                 pm25_lag_1_day |     -0.313      0.121
-2.577   0.010
                                 temp_daily_avg |     51.946      5.883
8.831   0.000
                               precip_daily_avg |   4257.695    333.364
12.772   0.000
                                                |
       c.temp_daily_avg#c.precip_daily_avg |     -6.861      0.552
-12.432   0.000
                                                |
                               relhum_daily_avg |      0.361      2.994
0.121   0.904
                                                |
       c.temp_daily_avg#c.relhum_daily_avg |      0.014      0.005
2.834   0.005
                                                |
                                press_daily_avg |      6.507      2.168
3.001   0.003
                                                |
        c.temp_daily_avg#c.press_daily_avg |     -0.513      0.057
-8.970   0.000
                                                |
                         winddir_cos_daily_avg |   -238.466     21.951
-10.864   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.261      0.023
11.352   0.000
                                                |
                         winddir_sin_daily_avg |    272.367     23.537
11.572   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.342   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.557      0.313
1.780   0.075
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -42.761      3.218
-13.290   0.000
                                                |
```

```
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.700      0.442
-3.849   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.257      0.961
7.549   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.006      0.030
-0.191   0.849
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.368   0.713
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.160      0.014
-11.796   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.397      0.213
11.258   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.616      0.229
-11.445   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est14 stored)
.         estadd scalar maxlag = 1

added scalar:
             e(maxlag) =  1
.
.         lincom pm25_pref

 ( 1)  pm25_pref = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+-------------------------------------------------------------
```

```
         (1) |  -.5237177   .1277112    -4.10   0.000    -.7740272
-.2734081
------------------------------------------------------------------------
--------
.         estadd scalar imp_b = r(estimate)

added scalar:
              e(imp_b) =  -.52371765
.         estadd scalar imp_s = r(se)

added scalar:
              e(imp_s) =  .12771119
.         estadd scalar imp_t = r(estimate) /r(se)

added scalar:
              e(imp_t) =  -4.1007967
.
.         lincom pm25_pref+pm25_lag_1_day

 ( 1)  pm25_pref + pm25_lag_1_day = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.8367666   .1527592    -5.48   0.000    -1.136169
-.5373639
------------------------------------------------------------------------
--------
.         estadd scalar cum_b = r(estimate)

added scalar:
              e(cum_b) =  -.83676658
.         estadd scalar cum_s = r(se)

added scalar:
              e(cum_s) =  .15275918
.         estadd scalar cum_t = r(estimate) /r(se)

added scalar:
              e(cum_t) =  -5.4776844
.
. esttab using table_4_a.tex , ///
> drop(*) ///
> mgroups("Unrestricted Finite Linear Lag",pattern(1 0 0 0 0 0 0)
prefix(\multicolumn{@span}{c}{) suffix(}) span ) ///
> star(* 0.10 ** 0.05 *** 0.01) label ///
> stats(maxlag N cum_b cum_s cum_t imp_b imp_s imp_t, ///
```

```
> fmt(%9.0gc %9.0gc %9.2f ) ///
> labels("Lags Included" "Observations" "Cumulative Effect" "S.E." "t"
"Impact Effect" "S.E." "t" ) ///
> layout("@" "@" "@" "(@)" "@" "@" "(@)" "@")) ///
> nobase mtitles() nomtitles ///
> compress se(3) b(3) replace nogaps noomitted ///
> indicate( ///
> , labels("Y" " ")) ///
> nonotes
(file table_4_a.tex not found)
(output written to table_4_a.tex)
.
. log close
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_4a.log
  log type:  text
 closed on:  23 Feb 2023, 11:05:52
-------------------------------------------------------------------------
-------------------------------------------------------------
-------------------------------------------------------------------------
-------------------------------------------------------------
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_4b.log
  log type:  text
 opened on:  23 Feb 2023, 11:05:52
. *** table_4_b
.
. eststo clear
.
.
.
. capture drop pdl_ml_*
. forval s = 0(1)2 {
  2.         gen pdl_ml_1_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day
  3.         gen pdl_ml_2_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day
  4.         gen pdl_ml_3_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day
  5.         gen pdl_ml_4_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day +
4^`s'*pm
> 25_lag_4_day
  6.         gen pdl_ml_5_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day +
4^`s'*pm
> 25_lag_4_day + 5^`s'*pm25_lag_5_day
  7.         gen pdl_ml_6_d_`s' = 0^`s'*pm25_pref +
```

```
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day +
4^`s'*pm
> 25_lag_4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day
  8.         gen pdl_ml_7_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day +
4^`s'*pm
> 25_lag_4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day
  9.         gen pdl_ml_8_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day +
4^`s'*pm
> 25_lag_4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day
 10. gen pdl_ml_9_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_4
> _day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day
 11. gen pdl_ml_10_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_
> 4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day +
10^`s'*pm25_lag_10_day
 12. gen pdl_ml_11_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_
> 4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day +
10^`s'*pm25_lag_10_day + 11^`s'*pm25_lag_11_day
 13. gen pdl_ml_12_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_
> 4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day +
10^`s'*pm25_lag_10_day + 11^`s'*pm25_lag_11_day +
12^`s'*pm25_lag_12_da
> y
 14. gen pdl_ml_13_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_
> 4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day +
10^`s'*pm25_lag_10_day + 11^`s'*pm25_lag_11_day +
12^`s'*pm25_lag_12_da
> y + 13^`s'*pm25_lag_13_day
 15. gen pdl_ml_14_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_
> 4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
```

```
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day +
10^`s'*pm25_lag_10_day + 11^`s'*pm25_lag_11_day +
12^`s'*pm25_lag_12_da
> y + 13^`s'*pm25_lag_13_day + 14^`s'*pm25_lag_14_day
 16. }
.
. forval i = 14(-1)1{
  2.         capture drop mydeg0
  3.         capture drop mydeg1
  4.         capture drop mydeg2
  5.         gen mydeg0 = pdl_ml_`i'_d_0
  6.         gen mydeg1 = pdl_ml_`i'_d_1
  7.         gen mydeg2 = pdl_ml_`i'_d_2
  8.
.         eststo: reghdfe percent mydeg0 mydeg1 mydeg2 `controls2' ,
absorb(`absorb1') vce(clust `cluster') `display_options'
  9.
.         lincom mydeg0 + 0 * mydeg1 + 0* mydeg2
 10.         estadd scalar imp_b = r(estimate)
 11.         estadd scalar imp_s = r(se)
 12.         estadd scalar imp_t = r(estimate) /r(se)
 13.
.         local j = (`i'*(`i'+1)) /2
 14.
.         local k = (`i'*(`i'+1)*(2*`i'+1)) /6
 15.
.         di `j'
 16.         di `k'
 17.
.         lincom (`i'+1)*mydeg0+(`j')*mydeg1+(`k')*mydeg2
 18.         estadd scalar cum_b = r(estimate)
 19.         estadd scalar cum_s = r(se)
 20.         estadd scalar cum_t = r(estimate) /r(se)
 21.
. }
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
95.77
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0681

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
             |               Robust
             |      percent | Coefficient  std. err.
t    P>|t|
-------------+----------------------------------------
+----------------------------------------
             |       mydeg0 |     -0.839      0.069
-12.177   0.000
             |       mydeg1 |     -0.004      0.019
-0.182   0.855
             |       mydeg2 |      0.005      0.001
```

```
3.833   0.000
                            temp_daily_avg |     45.246      5.940
7.617   0.000
                          precip_daily_avg |   4172.283    332.502
12.548   0.000
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -7.056      0.546
-12.930   0.000
                                           |
                          relhum_daily_avg |      3.451      2.974
1.160   0.246
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.027      0.005
5.778   0.000
                                           |
                           press_daily_avg |      8.218      2.171
3.785   0.000
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.452      0.058
-7.833   0.000
                                           |
                      winddir_cos_daily_avg |   -207.326     22.141
-9.364   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.239      0.023
10.343   0.000
                                           |
                      winddir_sin_daily_avg |    294.591     23.602
12.481   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.526      0.025
-20.924   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.406      0.312
1.298   0.194
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -41.778      3.210
-13.013   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.314      0.444
-5.217   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.405      0.968
5.581   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.037      0.030
-1.259   0.208
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.019      0.011
-1.690   0.091
```

```
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.176      0.014
-12.928   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.099      0.215
9.777   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.824      0.229
-12.319   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est1 stored)

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.8394695   .0689375   -12.18   0.000    -.9745846
-.7043544
------------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.83946951

added scalar:
              e(imp_s) =  .0689375

added scalar:
              e(imp_t) =  -12.177255
105
1015

 ( 1)  15*mydeg0 + 105*mydeg1 + 1015*mydeg2 = 0
```

```
------------------------------------------------------------------------------
-------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |   -8.05089    .595671   -13.52   0.000    -9.218384
-6.883395
------------------------------------------------------------------------------
-------

added scalar:
              e(cum_b) =  -8.0508899

added scalar:
              e(cum_s) =  .59567099

added scalar:
              e(cum_t) =  -13.515665
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
```

```
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
95.90
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0675

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------+----------------------------------
                                     mydeg0 |     -0.785      0.073
-10.769   0.000
                                     mydeg1 |     -0.025      0.022
-1.136   0.256
                                     mydeg2 |      0.007      0.002
4.355   0.000
                           temp_daily_avg |     44.186      5.948
7.429   0.000
                          precip_daily_avg |   4183.242    332.305
12.589   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.948      0.548
-12.677   0.000
                                            |
                          relhum_daily_avg |      3.873      2.981
1.300   0.194
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.028      0.005
5.945   0.000
                                            |
                           press_daily_avg |      8.361      2.170
```

```
3.852   0.000
                                                |
        c.temp_daily_avg#c.press_daily_avg |     -0.442      0.058
-7.655   0.000
                                                |
                        winddir_cos_daily_avg |   -206.526     21.960
-9.405   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.242      0.023
10.456   0.000
                                                |
                        winddir_sin_daily_avg |    295.236     23.559
12.532   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.527      0.025
-20.951   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.408      0.312
1.305   0.192
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -41.897      3.208
-13.058   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.400      0.446
-5.386   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.341      0.968
5.520   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.041      0.030
-1.401   0.161
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.019      0.011
-1.683   0.092
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.176      0.014
-12.958   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.091      0.213
9.820   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.831      0.229
-12.369   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
```

```
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-------------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |   -.784502   .0728457   -10.77   0.000     -.927277
-.641727
------------------------------------------------------------------------------

added scalar:
              e(imp_b) =  -.784502

added scalar:
              e(imp_s) =  .07284567

added scalar:
              e(imp_t) =  -10.76937
91
819

 ( 1)  14*mydeg0 + 91*mydeg1 + 819*mydeg2 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -7.690746   .5320542   -14.45   0.000    -8.733554
-6.647938
------------------------------------------------------------------------------

added scalar:
              e(cum_b) =  -7.6907459

added scalar:
```

```
              e(cum_s) =  .53205418

added scalar:
              e(cum_t) =  -14.454817
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
96.19
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
```

```
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0666

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-----------------------------------------
+-----------------------------------
                                     mydeg0 |     -0.911      0.078
-11.700   0.000
                                     mydeg1 |      0.023      0.025
0.921   0.357
                                     mydeg2 |      0.002      0.002
1.072   0.284
                           temp_daily_avg |     46.389      5.962
7.781   0.000
                         precip_daily_avg |   4169.299    332.331
12.546   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -7.222      0.553
-13.049   0.000
                                            |
                         relhum_daily_avg |      3.117      2.985
1.044   0.296
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.028      0.005
5.899   0.000
                                            |
                          press_daily_avg |      8.117      2.171
3.739   0.000
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.463      0.058
-8.000   0.000
                                            |
                     winddir_cos_daily_avg |   -208.134     21.933
-9.490   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.236      0.023
10.183   0.000
                                            |
                     winddir_sin_daily_avg |    295.000     23.559
12.522   0.000
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.528      0.025
-20.999   0.000
```

```
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.426      0.313
1.362   0.173
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -41.754      3.209
-13.012   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.187      0.448
-4.876   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.423      0.967
5.608   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.034      0.030
-1.142   0.253
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.019      0.011
-1.663   0.096
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.175      0.014
-12.859   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.107      0.213
9.906   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.829      0.229
-12.362   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est3 stored)

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
```

```
+------------------------------------------------------------------
         (1) |  -.9108933   .0778562   -11.70   0.000    -1.063489
-.7582979
------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.91089326

added scalar:
              e(imp_s) =  .07785616

added scalar:
              e(imp_t) =  -11.699694
78
650

 ( 1)  13*mydeg0 + 78*mydeg1 + 650*mydeg2 = 0

------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+------------------------------------------------------------------
         (1) |   -8.64699   .4805265   -17.99   0.000    -9.588806
-7.705175
------------------------------------------------------------------
--------

added scalar:
              e(cum_b) =  -8.6469905

added scalar:
              e(cum_s) =  .48052648

added scalar:
              e(cum_t) =  -17.994826
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
96.27
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0664

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                          |               Robust
                                  percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                   mydeg0 |     -0.924      0.078
-11.793   0.000
                                   mydeg1 |      0.049      0.028
```

```
1.740   0.082
                                     mydeg2 |     -0.001      0.002
-0.349   0.727
                           temp_daily_avg |     44.040      5.932
7.424   0.000
                          precip_daily_avg |   4256.113    332.500
12.800   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -7.050      0.549
-12.849   0.000
                                            |
                          relhum_daily_avg |      2.995      2.987
1.003   0.316
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.029      0.005
6.086   0.000
                                            |
                           press_daily_avg |      7.939      2.173
3.654   0.000
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.440      0.058
-7.644   0.000
                                            |
                      winddir_cos_daily_avg |   -205.468     21.947
-9.362   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.235      0.023
10.163   0.000
                                            |
                      winddir_sin_daily_avg |    292.694     23.564
12.421   0.000
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.525      0.025
-20.877   0.000
                                            |
     c.precip_daily_avg#c.relhum_daily_avg |      0.381      0.312
1.218   0.223
                                            |
      c.precip_daily_avg#c.press_daily_avg |    -42.599      3.210
-13.269   0.000
                                            |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.298      0.446
-5.157   0.000
                                            |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.313      0.967
5.492   0.000
                                            |
      c.relhum_daily_avg#c.press_daily_avg |     -0.033      0.030
-1.102   0.270
                                            |
```

```
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.019      0.011
-1.643   0.100
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.171      0.014
-12.566   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.080      0.213
9.774   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.808      0.229
-12.269   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est4 stored)

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.9236036   .0783162   -11.79   0.000    -1.077101
-.7701065
------------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.92360356

added scalar:
              e(imp_s) =  .07831621

added scalar:
              e(imp_t) =  -11.793261
66
506
```

```
 ( 1)  12*mydeg0 + 66*mydeg1 + 506*mydeg2 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |   -8.27802    .421159   -19.66   0.000    -9.103477   -7.452562
------------------------------------------------------------------------------

added scalar:
              e(cum_b) =  -8.2780196

added scalar:
              e(cum_s) =  .42115904

added scalar:
              e(cum_t) =  -19.655329
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
```

```
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
96.08
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0668

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
--------------------------------------------
+-----------------------------------------
                                     mydeg0 |     -0.922      0.078
-11.746   0.000
                                     mydeg1 |      0.081      0.031
2.616   0.009
                                     mydeg2 |     -0.005      0.003
-1.752   0.080
                           temp_daily_avg |     41.680      5.954
7.000   0.000
                          precip_daily_avg |   4326.201    333.350
12.978   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.751      0.547
-12.333   0.000
                                            |
                          relhum_daily_avg |      3.078      2.988
1.030   0.303
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.027      0.005
5.661   0.000
```

```
                                                 |
                            press_daily_avg |      8.010      2.173
3.686   0.000
                                                 |
        c.temp_daily_avg#c.press_daily_avg |     -0.416      0.058
-7.185   0.000
                                                 |
                       winddir_cos_daily_avg |   -203.890     21.952
-9.288   0.000
                                                 |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.247      0.023
10.741   0.000
                                                 |
                       winddir_sin_daily_avg |    294.250     23.564
12.487   0.000
                                                 |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.528      0.025
-21.018   0.000
                                                 |
     c.precip_daily_avg#c.relhum_daily_avg |      0.383      0.312
1.225   0.220
                                                 |
      c.precip_daily_avg#c.press_daily_avg |    -43.332      3.219
-13.460   0.000
                                                 |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.416      0.445
-5.428   0.000
                                                 |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.136      0.969
5.301   0.000
                                                 |
      c.relhum_daily_avg#c.press_daily_avg |     -0.033      0.030
-1.123   0.261
                                                 |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.019      0.011
-1.669   0.095
                                                 |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.173      0.014
-12.710   0.000
                                                 |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.065      0.213
9.699   0.000
                                                 |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.823      0.229
-12.333   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
```

```
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est5 stored)

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |  -.9219535   .0784898   -11.75   0.000    -1.075791   -.7681162
------------------------------------------------------------------------------

added scalar:
              e(imp_b) =  -.92195347

added scalar:
              e(imp_s) =  .07848981

added scalar:
              e(imp_t) =  -11.746155
55
385

 ( 1)  11*mydeg0 + 55*mydeg1 + 385*mydeg2 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |  -7.623803   .3694076   -20.64   0.000    -8.347829   -6.899777
------------------------------------------------------------------------------

added scalar:
              e(cum_b) =  -7.6238027
```

```
added scalar:
              e(cum_s) =  .3694076

added scalar:
              e(cum_t) =  -20.637915
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
93.02
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
```

```
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0760

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                     mydeg0 |     -0.764      0.080
-9.512   0.000
                                     mydeg1 |      0.003      0.035
0.073   0.941
                                     mydeg2 |      0.005      0.004
1.344   0.179
                           temp_daily_avg |     46.054      5.939
7.755   0.000
                         precip_daily_avg |   4157.727    333.038
12.484   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.728      0.550
-12.244   0.000
                                            |
                         relhum_daily_avg |      4.183      2.985
1.401   0.161
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.025      0.005
5.275   0.000
                                            |
                          press_daily_avg |      8.904      2.170
4.102   0.000
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.459      0.058
-7.944   0.000
                                            |
                     winddir_cos_daily_avg |   -215.183     21.929
-9.813   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.259      0.023
11.255   0.000
                                            |
                     winddir_sin_daily_avg |    290.433     23.558
12.328   0.000
                                            |
```

```
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.523      0.025
-20.816   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.430      0.312
1.376   0.169
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -41.670      3.217
-12.955   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.467      0.445
-5.543   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.799      0.966
6.006   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.044      0.030
-1.491   0.136
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.016      0.011
-1.436   0.151
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.179      0.014
-13.113   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.175      0.213
10.226   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.782      0.229
-12.158   0.000
------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est6 stored)

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
```

```
interval]
-------------
+------------------------------------------------------------------
         (1) |   -.763611   .0802765    -9.51   0.000    -.9209501
-.6062719
------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.763611

added scalar:
              e(imp_s) =  .08027647

added scalar:
              e(imp_t) =  -9.5122638
45
285

 ( 1)  10*mydeg0 + 45*mydeg1 + 285*mydeg2 = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+------------------------------------------------------------------
         (1) |  -6.125691   .3390705   -18.07   0.000    -6.790257
-5.461124
------------------------------------------------------------------------
--------

added scalar:
              e(cum_b) =  -6.1256906

added scalar:
              e(cum_s) =  .33907052

added scalar:
              e(cum_t) =  -18.066126
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
92.83
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0763

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                          |               Robust
                                  percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                   mydeg0 |     -0.834      0.087
```

```
-9.609   0.000
                                    mydeg1 |      0.061      0.043
1.397   0.162
                                    mydeg2 |     -0.003      0.005
-0.583   0.560
                          temp_daily_avg |     47.849      5.907
8.101   0.000
                         precip_daily_avg |   4117.879    332.688
12.378   0.000
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -6.747      0.549
-12.281   0.000
                                           |
                         relhum_daily_avg |      3.557      2.986
1.191   0.234
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.023      0.005
4.827   0.000
                                           |
                          press_daily_avg |      8.610      2.171
3.966   0.000
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.475      0.057
-8.270   0.000
                                           |
                     winddir_cos_daily_avg |   -222.050     21.861
-10.157   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.262      0.023
11.360   0.000
                                           |
                     winddir_sin_daily_avg |    290.192     23.558
12.318   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.521      0.025
-20.747   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.487      0.313
1.556   0.120
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -41.312      3.213
-12.857   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.410      0.445
-5.421   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.761      0.966
5.962   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.038      0.030
```

```
-1.272   0.203
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.015      0.011
-1.343   0.179
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.177      0.014
-13.005   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.243      0.212
10.579   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.781      0.229
-12.152   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est7 stored)

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.8336791   .0867583    -9.61   0.000    -1.003722
-.6636359
------------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.83367906

added scalar:
              e(imp_s) =  .08675826

added scalar:
              e(imp_t) =  -9.609218
```

```
36
204

 ( 1)  9*mydeg0 + 36*mydeg1 + 204*mydeg2 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |   -5.92883   .3222516   -18.40   0.000    -6.560432   -5.297228
------------------------------------------------------------------------------

added scalar:
              e(cum_b) =  -5.9288303

added scalar:
              e(cum_s) =  .3222516

added scalar:
              e(cum_t) =  -18.398141
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
```

```
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
91.80
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,957         Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0798

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                     mydeg0 |     -0.835      0.094
-8.857   0.000
                                     mydeg1 |      0.090      0.055
1.632   0.103
                                     mydeg2 |     -0.008      0.007
-1.091   0.275
                            temp_daily_avg |     49.000      5.903
8.301   0.000
                          precip_daily_avg |   4131.734    332.845
12.413   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -7.116      0.546
-13.032   0.000
                                            |
                          relhum_daily_avg |      2.448      3.000
0.816   0.414
                                            |
```

```
       c.temp_daily_avg#c.relhum_daily_avg |      0.022      0.005
4.651   0.000
                                           |
                           press_daily_avg |      8.212      2.177
3.772   0.000
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.485      0.057
-8.458   0.000
                                           |
                      winddir_cos_daily_avg |   -230.998     21.864
-10.565   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.259      0.023
11.240   0.000
                                           |
                      winddir_sin_daily_avg |    286.463     23.550
12.164   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.517      0.025
-20.600   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.371      0.312
1.188   0.235
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -41.337      3.214
-12.860   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.396      0.445
-5.382   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.304      0.962
6.554   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.027      0.030
-0.892   0.372
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.013      0.011
-1.131   0.258
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.177      0.014
-12.983   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.331      0.212
10.993   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.745      0.229
-11.999   0.000
------------------------------------------------------------------------
-------------
```

```
Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est8 stored)

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |  -.8349734   .0942715    -8.86   0.000    -1.019742   -.6502046
------------------------------------------------------------------------------

added scalar:
              e(imp_b) =  -.8349734

added scalar:
              e(imp_s) =  .09427147

added scalar:
              e(imp_t) =  -8.8571166
28
140

 ( 1)  8*mydeg0 + 28*mydeg1 + 140*mydeg2 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |  -5.292684   .2997483   -17.66   0.000     -5.88018   -4.705188
------------------------------------------------------------------------------
```

```
added scalar:
              e(cum_b) =  -5.292684

added scalar:
              e(cum_s) =  .29974833

added scalar:
              e(cum_t) =  -17.657092
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
91.85
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
```

```
0.4874
                                                Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959       Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026     Root MSE        =
441.0796

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                           |               Robust
                                   percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------+----------------------------------
                                    mydeg0 |     -0.886      0.098
-9.070   0.000
                                    mydeg1 |      0.235      0.068
3.431   0.001
                                    mydeg2 |     -0.039      0.011
-3.600   0.000
                           temp_daily_avg |     52.168      5.884
8.865   0.000
                          precip_daily_avg |   4036.148    332.734
12.130   0.000
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -7.278      0.546
-13.326   0.000
                                           |
                          relhum_daily_avg |      3.048      2.997
1.017   0.309
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.019      0.005
3.945   0.000
                                           |
                           press_daily_avg |      8.498      2.176
3.904   0.000
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.514      0.057
-8.995   0.000
                                           |
                      winddir_cos_daily_avg |   -222.295     21.874
-10.162   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.261      0.023
11.329   0.000
                                           |
                      winddir_sin_daily_avg |    274.591     23.574
```

```
11.648   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.507      0.025
-20.199   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.421      0.312
1.349   0.177
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -40.417      3.213
-12.578   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.643      0.449
-5.882   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.693      0.961
6.965   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.032      0.030
-1.088   0.277
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.009      0.011
-0.803   0.422
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.171      0.014
-12.539   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.242      0.212
10.568   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.631      0.229
-11.493   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est9 stored)

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
```

```
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+------------------------------------------------------------------
         (1) |   -.885515   .0976274    -9.07   0.000    -1.076861
-.6941686
------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.88551499

added scalar:
              e(imp_s) =  .09762743

added scalar:
              e(imp_t) =  -9.0703504
21
91

 ( 1)  7*mydeg0 + 21*mydeg1 + 91*mydeg2 = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+------------------------------------------------------------------
         (1) |  -4.808684   .2692148   -17.86   0.000    -5.336336
-4.281032
------------------------------------------------------------------------
--------

added scalar:
              e(cum_b) =  -4.8086842

added scalar:
              e(cum_s) =  .26921483

added scalar:
              e(cum_t) =  -17.861885
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
87.93
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0912

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                          |               Robust
                                  percent | Coefficient  std. err.
t    P>|t|
-----------------------------------------
```

```
+--------------------------------------
                                    mydeg0 |     -0.749      0.103
-7.274   0.000
                                    mydeg1 |      0.172      0.089
1.936   0.053
                                    mydeg2 |     -0.033      0.017
-1.963   0.050
                              temp_daily_avg |     55.625      5.889
9.446   0.000
                             precip_daily_avg |   3936.764    334.693
11.762   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -7.120      0.546
-13.039   0.000
                                             |
                             relhum_daily_avg |      3.474      2.997
1.159   0.246
                                             |
       c.temp_daily_avg#c.relhum_daily_avg |      0.020      0.005
4.054   0.000
                                             |
                              press_daily_avg |      9.201      2.175
4.230   0.000
                                             |
        c.temp_daily_avg#c.press_daily_avg |     -0.550      0.057
-9.619   0.000
                                             |
                        winddir_cos_daily_avg |   -230.830     21.868
-10.556   0.000
                                             |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.256      0.023
11.089   0.000
                                             |
                        winddir_sin_daily_avg |    281.990     23.562
11.968   0.000
                                             |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.506      0.025
-20.120   0.000
                                             |
     c.precip_daily_avg#c.relhum_daily_avg |      0.498      0.313
1.591   0.112
                                             |
      c.precip_daily_avg#c.press_daily_avg |    -39.461      3.232
-12.210   0.000
                                             |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.078      0.445
-4.669   0.000
                                             |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.745      0.961
7.018   0.000
```

```
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.037      0.030
-1.243   0.214
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.014      0.011
-1.193   0.233
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.177      0.014
-12.957   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.328      0.212
10.979   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.701      0.229
-11.805   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est10 stored)

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.7488382   .1029534    -7.27   0.000    -.9506234
-.5470531
------------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.74883824

added scalar:
              e(imp_s) =  .10295344
```

```
added scalar:
              e(imp_t) =  -7.273562
15
55

 ( 1)  6*mydeg0 + 15*mydeg1 + 55*mydeg2 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |  -3.728916   .2450072   -15.22   0.000    -4.209121   -3.24871
------------------------------------------------------------------------------

added scalar:
              e(cum_b) =  -3.7289158

added scalar:
              e(cum_s) =  .24500723

added scalar:
              e(cum_t) =  -15.219615
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
```

```
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
85.06
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0999

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                             |               Robust
                                     percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                      mydeg0 |     -0.521      0.111
-4.708   0.000
                                      mydeg1 |     -0.128      0.125
-1.028   0.304
                                      mydeg2 |      0.036      0.030
1.218   0.223
                             temp_daily_avg |     53.473      5.885
9.087   0.000
                           precip_daily_avg |   4212.020    336.737
12.508   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -7.100      0.548
-12.957   0.000
                                             |
                           relhum_daily_avg |      2.795      2.999
```

```
0.932   0.351
                                                 |
       c.temp_daily_avg#c.relhum_daily_avg |      0.024      0.005
4.919   0.000
                                                 |
                            press_daily_avg |      8.959      2.176
4.118   0.000
                                                 |
        c.temp_daily_avg#c.press_daily_avg |     -0.532      0.057
-9.308   0.000
                                                 |
                      winddir_cos_daily_avg |   -239.942     21.843
-10.985   0.000
                                                 |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.264      0.023
11.466   0.000
                                                 |
                      winddir_sin_daily_avg |    282.684     23.641
11.957   0.000
                                                 |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.514      0.025
-20.451   0.000
                                                 |
     c.precip_daily_avg#c.relhum_daily_avg |      0.436      0.316
1.382   0.167
                                                 |
      c.precip_daily_avg#c.press_daily_avg |    -42.172      3.249
-12.981   0.000
                                                 |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.621      0.442
-3.670   0.000
                                                 |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.062      0.960
7.354   0.000
                                                 |
      c.relhum_daily_avg#c.press_daily_avg |     -0.031      0.030
-1.026   0.305
                                                 |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.012      0.011
-1.028   0.304
                                                 |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.179      0.014
-13.023   0.000
                                                 |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.416      0.212
11.408   0.000
                                                 |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.707      0.230
-11.789   0.000
------------------------------------------------------------------------------
```

```
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est11 stored)

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |  -.5208869   .1106399    -4.71   0.000    -.7377372   -.3040366
------------------------------------------------------------------------------

added scalar:
              e(imp_b) =  -.52088688

added scalar:
              e(imp_s) =  .11063987

added scalar:
              e(imp_t) =  -4.7079493
10
30

 ( 1)  5*mydeg0 + 10*mydeg1 + 30*mydeg2 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |  -2.800465   .2268331   -12.35   0.000     -3.24505   -2.35588
------------------------------------------------------------------------------
```

```
--------

added scalar:
              e(cum_b) =  -2.8004653

added scalar:
              e(cum_s) =  .22683313

added scalar:
              e(cum_t) =  -12.345927
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
84.56
Statistics robust to heteroskedasticity           Prob > F        =
```

```
0.0000
                                                R-squared       =
0.4874
                                                Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959       Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026     Root MSE        =
441.1013

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                          |               Robust
                                   percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                    mydeg0 |     -0.524      0.117
-4.495   0.000
                                    mydeg1 |      0.070      0.187
0.377   0.706
                                    mydeg2 |     -0.054      0.060
-0.902   0.367
                            temp_daily_avg |     52.746      5.892
8.952   0.000
                          precip_daily_avg |   4370.071    333.363
13.109   0.000
                                          |
       c.temp_daily_avg#c.precip_daily_avg |     -7.103      0.549
-12.944   0.000
                                          |
                          relhum_daily_avg |      2.663      2.999
0.888   0.375
                                          |
       c.temp_daily_avg#c.relhum_daily_avg |      0.023      0.005
4.720   0.000
                                          |
                           press_daily_avg |      8.829      2.175
4.058   0.000
                                          |
        c.temp_daily_avg#c.press_daily_avg |     -0.525      0.057
-9.165   0.000
                                          |
                     winddir_cos_daily_avg |   -233.553     21.915
-10.657   0.000
                                          |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.269      0.023
11.701   0.000
```

```
                                                |
                     winddir_sin_daily_avg |    273.369     23.536
11.615   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.512      0.025
-20.364   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.332      0.314
1.058   0.290
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -43.679      3.217
-13.577   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.622      0.442
-3.672   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.244      0.960
7.542   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.029      0.030
-0.978   0.328
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.011      0.011
-0.931   0.352
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.171      0.014
-12.594   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.352      0.213
11.066   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.619      0.229
-11.456   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est12 stored)

 ( 1)  mydeg0 = 0
```

```
------------------------------------------------------------------------------
-------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.5240725   .1165987    -4.49   0.000    -.7526018
-.2955431
------------------------------------------------------------------------------
-------

added scalar:
              e(imp_b) =  -.52407247

added scalar:
              e(imp_s) =  .11659868

added scalar:
              e(imp_t) =  -4.4946689
6
14

 ( 1)  4*mydeg0 + 6*mydeg1 + 14*mydeg2 = 0

------------------------------------------------------------------------------
-------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -2.426349   .2022079   -12.00   0.000    -2.822669
-2.030028
------------------------------------------------------------------------------
-------

added scalar:
              e(cum_b) =  -2.4263488

added scalar:
              e(cum_s) =  .20220788

added scalar:
              e(cum_t) =  -11.999279
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
84.84
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1005

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                        |               Robust
                                percent | Coefficient  std. err.
```

```
t    P>|t|
------------------------------------------
+-----------------------------------------
                                    mydeg0 |     -0.863      0.131
-6.589   0.000
                                    mydeg1 |      2.325      0.389
5.980   0.000
                                    mydeg2 |     -1.278      0.187
-6.847   0.000
                              temp_daily_avg |     55.639      5.886
9.453   0.000
                             precip_daily_avg |   4324.703    333.459
12.969   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -6.756      0.552
-12.237   0.000
                                             |
                             relhum_daily_avg |      3.510      3.002
1.169   0.242
                                             |
       c.temp_daily_avg#c.relhum_daily_avg |      0.015      0.005
2.965   0.003
                                             |
                              press_daily_avg |      9.393      2.178
4.314   0.000
                                             |
        c.temp_daily_avg#c.press_daily_avg |     -0.549      0.057
-9.602   0.000
                                             |
                         winddir_cos_daily_avg |   -229.090     21.948
-10.438   0.000
                                             |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.269      0.023
11.682   0.000
                                             |
                         winddir_sin_daily_avg |    259.027     23.571
10.989   0.000
                                             |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.513      0.025
-20.391   0.000
                                             |
     c.precip_daily_avg#c.relhum_daily_avg |      0.291      0.314
0.926   0.354
                                             |
      c.precip_daily_avg#c.press_daily_avg |    -43.220      3.218
-13.430   0.000
                                             |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.779      0.442
-4.027   0.000
                                             |
```

```
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.472      0.961
7.771   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.037      0.030
-1.245   0.213
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.355   0.723
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.166      0.014
-12.184   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.303      0.213
10.817   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.480      0.229
-10.830   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est13 stored)

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.8625883   .1309057    -6.59   0.000    -1.119159
-.6060177
------------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.86258829

added scalar:
```

```
              e(imp_s) =  .13090568

added scalar:
              e(imp_t) =  -6.5893877
3
5

 ( 1)  3*mydeg0 + 3*mydeg1 + 5*mydeg2 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |  -2.000378   .1813246   -11.03   0.000    -2.355768   -1.644988
------------------------------------------------------------------------------

added scalar:
              e(cum_b) =  -2.0003781

added scalar:
              e(cum_s) =  .18132465

added scalar:
              e(cum_t) =  -11.032026
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: mydeg2 omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
```

```
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  22,   1025) =
81.88
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1193

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                     mydeg0 |     -0.524      0.128
-4.101   0.000
                                     mydeg1 |      0.211      0.197
1.070   0.285
                                            |
                              temp_daily_avg |     51.946      5.883
8.831   0.000
                            precip_daily_avg |   4257.695    333.364
12.772   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.861      0.552
-12.432   0.000
```

```
                                                 |
                            relhum_daily_avg |      0.361      2.994
0.121   0.904
                                                 |
       c.temp_daily_avg#c.relhum_daily_avg |      0.014      0.005
2.834   0.005
                                                 |
                             press_daily_avg |      6.507      2.168
3.001   0.003
                                                 |
        c.temp_daily_avg#c.press_daily_avg |     -0.513      0.057
-8.970   0.000
                                                 |
                        winddir_cos_daily_avg |   -238.466     21.951
-10.864   0.000
                                                 |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.261      0.023
11.352   0.000
                                                 |
                        winddir_sin_daily_avg |    272.367     23.537
11.572   0.000
                                                 |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.342   0.000
                                                 |
     c.precip_daily_avg#c.relhum_daily_avg |      0.557      0.313
1.780   0.075
                                                 |
      c.precip_daily_avg#c.press_daily_avg |    -42.761      3.218
-13.290   0.000
                                                 |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.700      0.442
-3.849   0.000
                                                 |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.257      0.961
7.549   0.000
                                                 |
      c.relhum_daily_avg#c.press_daily_avg |     -0.006      0.030
-0.191   0.849
                                                 |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.368   0.713
                                                 |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.160      0.014
-11.796   0.000
                                                 |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.397      0.213
11.258   0.000
                                                 |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.616      0.229
```

```
-11.445   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est14 stored)

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.5237176   .1277112    -4.10   0.000    -.7740271
-.2734081
------------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.52371757

added scalar:
              e(imp_s) =  .12771119

added scalar:
              e(imp_t) =  -4.1007962
1
1

 ( 1)  2*mydeg0 + mydeg1 + o.mydeg2 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.8367665   .1527592    -5.48   0.000    -1.136169
```

```
-.5373638
------------------------------------------------------------------------
--------

added scalar:
              e(cum_b) =  -.83676652

added scalar:
              e(cum_s) =  .15275918

added scalar:
              e(cum_t) =  -5.477684
.
. esttab using table_4_b.tex , ///
> drop(*) ///
> mgroups("Restricted Finite Distributed Quadratic Lag",pattern(1 0 0
0 0 0 0) prefix(\multicolumn{@span}{c}{) suffix(}) span ) /
> //
> star(* 0.10 ** 0.05 *** 0.01) label ///
> stats(maxlag N cum_b cum_s cum_t imp_b imp_s imp_t, ///
> fmt(%9.0gc %9.0gc %9.2f) ///
> labels("Lags Included" "Observations" "Cumulative Effect" "S.E." "t"
"Impact Effect" "S.E." "t" ) ///
> layout("@" "@" "@" "(@)" "@" "@" "(@)" "@")) ///
> nobase mtitles() nomtitles ///
> compress se(3) b(3) replace nogaps noomitted ///
> nonotes
(file table_4_b.tex not found)
(output written to table_4_b.tex)
.
. log close
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_4b.log
  log type:  text
 closed on:  23 Feb 2023, 11:36:36
------------------------------------------------------------------------
------------------------------------------------------------
------------------------------------------------------------------------
------------------------------------------------------------
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_4c.log
  log type:  text
 opened on:  23 Feb 2023, 11:36:36
. * table_4_c
. eststo clear
.
. capture drop pdl_ml_*
. forval s = 0(1)3 {
```

```
  2.          gen pdl_ml_1_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day
  3.          gen pdl_ml_2_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day
  4.          gen pdl_ml_3_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day
  5.          gen pdl_ml_4_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day +
4^`s'*p
> m25_lag_4_day
  6.          gen pdl_ml_5_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day +
4^`s'*p
> m25_lag_4_day + 5^`s'*pm25_lag_5_day
  7.          gen pdl_ml_6_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day +
4^`s'*p
> m25_lag_4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day
  8.          gen pdl_ml_7_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day +
4^`s'*p
> m25_lag_4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day
  9.          gen pdl_ml_8_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day +
4^`s'*p
> m25_lag_4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day
 10. gen pdl_ml_9_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_4
> _day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day
 11. gen pdl_ml_10_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_
> 4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day +
10^`s'*pm25_lag_10_day
 12. gen pdl_ml_11_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_
> 4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day +
10^`s'*pm25_lag_10_day + 11^`s'*pm25_lag_11_day
 13. gen pdl_ml_12_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_
> 4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
```

```
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day +
10^`s'*pm25_lag_10_day + 11^`s'*pm25_lag_11_day +
12^`s'*pm25_lag_12_da
> y
 14. gen pdl_ml_13_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_
> 4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day +
10^`s'*pm25_lag_10_day + 11^`s'*pm25_lag_11_day +
12^`s'*pm25_lag_12_da
> y + 13^`s'*pm25_lag_13_day
 15. gen pdl_ml_14_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_
> 4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day +
10^`s'*pm25_lag_10_day + 11^`s'*pm25_lag_11_day +
12^`s'*pm25_lag_12_da
> y + 13^`s'*pm25_lag_13_day + 14^`s'*pm25_lag_14_day
 16. }
.
. forval i = 14(-1)1 {
  2.         capture drop mydeg0
  3.         capture drop mydeg1
  4.         capture drop mydeg2
  5.         capture drop mydeg3
  6.         gen mydeg0 = pdl_ml_`i'_d_0
  7.         gen mydeg1 = pdl_ml_`i'_d_1
  8.         gen mydeg2 = pdl_ml_`i'_d_2
  9.         gen mydeg3 = pdl_ml_`i'_d_3
 10.
.         eststo: reghdfe percent mydeg0 mydeg1 mydeg2 mydeg3
`controls2' , absorb(`absorb1') vce(clust `cluster') `display_optio
> ns'
 11.
.         estadd scalar maxlag = `i'
 12.
.         lincom mydeg0 + 0 * mydeg1 + 0* mydeg2
 13.         estadd scalar imp_b = r(estimate)
 14.         estadd scalar imp_s = r(se)
 15.         estadd scalar imp_t = r(estimate) /r(se)
 16.
.         local j = (`i'*(`i'+1)) /2
 17.
.         local k = (`i'*(`i'+1)*(2*`i'+1)) /6
 18.
.         local l = (`i'^2)*((`i'+1)^2) /4
 19.
.         lincom (`i'+1)*mydeg0+(`j')*mydeg1+(`k')*mydeg2+(`l')*mydeg3
```

```
 20.         estadd scalar cum_b = r(estimate)
 21.         estadd scalar cum_s = r(se)
 22.         estadd scalar cum_t = r(estimate) /r(se)
 23.
. }
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  24,   1025) =
91.85
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
```

```
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0679

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-----------------------------------------
+-----------------------------------------
                                     mydeg0 |     -0.920      0.089
-10.303   0.000
                                     mydeg1 |      0.059      0.048
1.230   0.219
                                     mydeg2 |     -0.006      0.008
-0.781   0.435
                                     mydeg3 |      0.001      0.000
1.424   0.154
                           temp_daily_avg |     45.344      5.940
7.633   0.000
                         precip_daily_avg |   4175.051    332.518
12.556   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -7.121      0.547
-13.009   0.000
                                            |
                         relhum_daily_avg |      2.898      3.001
0.966   0.334
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.027      0.005
5.717   0.000
                                            |
                          press_daily_avg |      7.957      2.179
3.651   0.000
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.452      0.058
-7.841   0.000
                                            |
                     winddir_cos_daily_avg |   -205.213     22.201
-9.244   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.238      0.023
10.279   0.000
                                            |
                     winddir_sin_daily_avg |    292.455     23.662
12.360   0.000
```

```
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.525      0.025
-20.880   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.412      0.312
1.320   0.187
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -41.808      3.211
-13.022   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.262      0.445
-5.082   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.375      0.969
5.549   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.032      0.030
-1.060   0.289
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.020      0.011
-1.727   0.084
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.174      0.014
-12.758   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.078      0.215
9.654   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.804      0.230
-12.201   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est1 stored)

added scalar:
            e(maxlag) =  14

 ( 1)  mydeg0 = 0
```

```
------------------------------------------------------------------------------
-------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.9198971   .0892802   -10.30   0.000    -1.094883
-.744911
------------------------------------------------------------------------------
-------

added scalar:
              e(imp_b) =  -.91989709

added scalar:
              e(imp_s) =  .0892802

added scalar:
              e(imp_t) =  -10.303483

 ( 1)  15*mydeg0 + 105*mydeg1 + 1015*mydeg2 + 11025*mydeg3 = 0

------------------------------------------------------------------------------
-------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -8.098549   .5967428   -13.57   0.000    -9.268144
-6.928954
------------------------------------------------------------------------------
-------

added scalar:
              e(cum_b) =  -8.0985493

added scalar:
              e(cum_s) =  .59674276

added scalar:
              e(cum_t) =  -13.571257
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  24,   1025) =
92.33
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0659

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                          |               Robust
                                  percent | Coefficient  std. err.
t    P>|t|
-----------------------------------------
```

```
+--------------------------------------
                                    mydeg0 |     -0.986      0.091
-10.866   0.000
                                    mydeg1 |      0.154      0.053
2.914   0.004
                                    mydeg2 |     -0.027      0.009
-2.924   0.003
                                    mydeg3 |      0.002      0.000
3.701   0.000
                           temp_daily_avg |     43.362      5.952
7.285   0.000
                         precip_daily_avg |   4231.830    332.593
12.724   0.000
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -6.969      0.548
-12.714   0.000
                                           |
                         relhum_daily_avg |      2.851      2.993
0.953   0.341
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.028      0.005
5.900   0.000
                                           |
                          press_daily_avg |      7.862      2.174
3.616   0.000
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.433      0.058
-7.492   0.000
                                           |
                    winddir_cos_daily_avg |   -202.550     21.988
-9.212   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.243      0.023
10.501   0.000
                                           |
                    winddir_sin_daily_avg |    291.322     23.584
12.352   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.525      0.025
-20.903   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.437      0.313
1.397   0.162
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -42.412      3.212
-13.205   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.353      0.446
-5.279   0.000
                                           |
```

```
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.210      0.968
5.380   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.031      0.030
-1.046   0.296
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.019      0.011
-1.654   0.098
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.172      0.014
-12.585   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.051      0.213
9.620   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.795      0.229
-12.199   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)

added scalar:
             e(maxlag) =  13

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.9860103     .09074   -10.87   0.000    -1.163857
-.8081631
------------------------------------------------------------------------------
--------

added scalar:
```

```
              e(imp_b) =  -.98601026

added scalar:
              e(imp_s) =  .09073996

added scalar:
              e(imp_t) =  -10.866329

 ( 1)  14*mydeg0 + 91*mydeg1 + 819*mydeg2 + 8281*mydeg3 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |  -7.754629    .532399   -14.57   0.000    -8.798113   -6.711146
------------------------------------------------------------------------------

added scalar:
              e(cum_b) =  -7.7546295

added scalar:
              e(cum_s) =  .532399

added scalar:
              e(cum_t) =  -14.565447
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
```

```
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  24,   1025) =
92.20
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0666

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                     mydeg0 |     -0.961      0.091
-10.530   0.000
                                     mydeg1 |      0.077      0.058
1.340   0.180
                                     mydeg2 |     -0.009      0.011
-0.829   0.407
                                     mydeg3 |      0.001      0.001
1.032   0.302
                           temp_daily_avg |     45.738      5.996
7.628   0.000
                         precip_daily_avg |   4193.477    333.338
12.580   0.000
```

```
                                                 |
       c.temp_daily_avg#c.precip_daily_avg |     -7.157      0.557
-12.852   0.000
                                                 |
                           relhum_daily_avg |      2.906      2.993
0.971   0.332
                                                 |
       c.temp_daily_avg#c.relhum_daily_avg |      0.027      0.005
5.765   0.000
                                                 |
                            press_daily_avg |      7.992      2.174
3.676   0.000
                                                 |
        c.temp_daily_avg#c.press_daily_avg |     -0.456      0.058
-7.826   0.000
                                                 |
                       winddir_cos_daily_avg |   -207.306     21.940
-9.449   0.000
                                                 |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.237      0.023
10.217   0.000
                                                 |
                       winddir_sin_daily_avg |    294.228     23.566
12.485   0.000
                                                 |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.527      0.025
-20.978   0.000
                                                 |
     c.precip_daily_avg#c.relhum_daily_avg |      0.427      0.313
1.366   0.172
                                                 |
      c.precip_daily_avg#c.press_daily_avg |    -42.003      3.220
-13.046   0.000
                                                 |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.218      0.449
-4.936   0.000
                                                 |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.377      0.968
5.555   0.000
                                                 |
      c.relhum_daily_avg#c.press_daily_avg |     -0.032      0.030
-1.065   0.287
                                                 |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.019      0.011
-1.640   0.101
                                                 |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.174      0.014
-12.732   0.000
                                                 |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.098      0.213
```

```
9.863   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.822      0.229
-12.329   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est3 stored)

added scalar:
             e(maxlag) =  12

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.9612749   .0912895   -10.53   0.000    -1.140199
-.7823507
------------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.96127495

added scalar:
              e(imp_s) =  .09128951

added scalar:
              e(imp_t) =  -10.52996

 ( 1)  13*mydeg0 + 78*mydeg1 + 650*mydeg2 + 6084*mydeg3 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
```

```
interval]
-------------
+------------------------------------------------------------------
         (1) |  -8.645168   .4805211   -17.99   0.000    -9.586973
-7.703363
------------------------------------------------------------------------------
--------

added scalar:
              e(cum_b) =  -8.6451682

added scalar:
              e(cum_s) =  .48052115

added scalar:
              e(cum_t) =  -17.991234
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
```

```
HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  24,   1025) =
92.30
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0665

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                           |               Robust
                                   percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                    mydeg0 |     -0.900      0.093
-9.697   0.000
                                    mydeg1 |      0.022      0.065
0.335   0.738
                                    mydeg2 |      0.005      0.014
0.396   0.692
                                    mydeg3 |     -0.000      0.001
-0.462   0.644
                            temp_daily_avg |     44.208      5.941
7.441   0.000
                          precip_daily_avg |   4251.880    332.758
12.778   0.000
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -7.078      0.552
-12.824   0.000
                                           |
                          relhum_daily_avg |      3.077      2.992
1.028   0.304
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.029      0.005
6.059   0.000
                                           |
                           press_daily_avg |      7.980      2.174
3.670   0.000
                                           |
```

```
        c.temp_daily_avg#c.press_daily_avg |     -0.442      0.058
-7.661   0.000
                                           |
                      winddir_cos_daily_avg |   -205.624     21.945
-9.370   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.234      0.023
10.051   0.000
                                           |
                      winddir_sin_daily_avg |    292.877     23.565
12.428   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.525      0.025
-20.877   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.375      0.313
1.200   0.230
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -42.549      3.214
-13.240   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.285      0.446
-5.119   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.328      0.968
5.506   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.034      0.030
-1.130   0.259
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.019      0.011
-1.654   0.098
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.172      0.014
-12.579   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.082      0.213
9.783   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.810      0.229
-12.276   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
```

```
         dow |         7          1          6     |
        strm |        24          1         23    ?|
-------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est4 stored)

added scalar:
             e(maxlag) =  11

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.8998472   .0927978    -9.70   0.000    -1.081728
-.7179666
------------------------------------------------------------------------------

added scalar:
              e(imp_b) =  -.89984717

added scalar:
              e(imp_s) =  .09279784

added scalar:
              e(imp_t) =  -9.6968544

 ( 1)  12*mydeg0 + 66*mydeg1 + 506*mydeg2 + 4356*mydeg3 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -8.275476   .4211906   -19.65   0.000    -9.100995
-7.449957
------------------------------------------------------------------------------

added scalar:
              e(cum_b) =  -8.2754761

added scalar:
              e(cum_s) =  .42119059
```

```
added scalar:
              e(cum_t) =  -19.647818
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  24,   1025) =
92.77
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
```

```
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0655

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
--------------------------------------------
+-----------------------------------------
                                     mydeg0 |     -0.720      0.098
-7.353   0.000
                                     mydeg1 |     -0.164      0.078
-2.101   0.036
                                     mydeg2 |      0.057      0.018
3.090   0.002
                                     mydeg3 |     -0.004      0.001
-3.404   0.001
                           temp_daily_avg |     41.422      5.956
6.955   0.000
                         precip_daily_avg |   4360.131    333.414
13.077   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.900      0.549
-12.572   0.000
                                            |
                         relhum_daily_avg |      3.695      2.993
1.235   0.217
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.030      0.005
6.278   0.000
                                            |
                          press_daily_avg |      8.291      2.174
3.814   0.000
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.416      0.058
-7.189   0.000
                                            |
                     winddir_cos_daily_avg |   -202.467     21.959
-9.220   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.240      0.023
10.385   0.000
                                            |
                     winddir_sin_daily_avg |    297.246     23.579
12.606   0.000
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.531      0.025
```

```
-21.128   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.317      0.313
1.012   0.311
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -43.606      3.220
-13.544   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.313      0.446
-5.184   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.082      0.969
5.244   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.040      0.030
-1.345   0.179
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.021      0.011
-1.838   0.066
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.175      0.014
-12.848   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.052      0.213
9.636   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.852      0.229
-12.451   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est5 stored)

added scalar:
             e(maxlag) =  10

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
```

```
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+------------------------------------------------------------------
         (1) |  -.7195401   .0978525    -7.35   0.000    -.9113276
-.5277527
------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.71954011

added scalar:
              e(imp_s) =  .09785247

added scalar:
              e(imp_t) =  -7.3533157

 ( 1)  11*mydeg0 + 55*mydeg1 + 385*mydeg2 + 3025*mydeg3 = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+------------------------------------------------------------------
         (1) |  -7.564284   .3698618   -20.45   0.000      -8.2892
-6.839367
------------------------------------------------------------------------
--------

added scalar:
              e(cum_b) =  -7.5642837

added scalar:
              e(cum_s) =  .36986178

added scalar:
              e(cum_t) =  -20.45165
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  24,   1025) =
89.18
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0758

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                          |               Robust
                                  percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                   mydeg0 |     -0.862      0.106
```

```
-8.105   0.000
                                    mydeg1 |      0.130      0.098
1.325   0.185
                                    mydeg2 |     -0.030      0.026
-1.181   0.238
                                    mydeg3 |      0.003      0.002
1.385   0.166
                           temp_daily_avg |     46.454      5.948
7.810   0.000
                         precip_daily_avg |   4134.657    333.367
12.403   0.000
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -6.734      0.550
-12.255   0.000
                                           |
                         relhum_daily_avg |      3.655      3.005
1.216   0.224
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.023      0.005
4.715   0.000
                                           |
                          press_daily_avg |      8.622      2.177
3.960   0.000
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.461      0.058
-7.982   0.000
                                           |
                     winddir_cos_daily_avg |   -216.989     21.968
-9.877   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.260      0.023
11.285   0.000
                                           |
                     winddir_sin_daily_avg |    289.460     23.565
12.284   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.521      0.025
-20.716   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.454      0.313
1.452   0.146
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -41.459      3.219
-12.879   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.499      0.446
-5.607   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.806      0.966
6.013   0.000
```

```
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.039      0.030
-1.296   0.195
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.016      0.011
-1.359   0.174
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.177      0.014
-12.980   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.192      0.213
10.291   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.773      0.229
-12.118   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est6 stored)

added scalar:
             e(maxlag) =  9

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.8615962   .1063072    -8.10   0.000    -1.069955
-.6532379
------------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.86159622
```

```
added scalar:
              e(imp_s) =  .10630716

added scalar:
              e(imp_t) =  -8.104781

 ( 1)  10*mydeg0 + 45*mydeg1 + 285*mydeg2 + 2025*mydeg3 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |  -6.161323   .3400726   -18.12   0.000    -6.827854   -5.494793
------------------------------------------------------------------------------

added scalar:
              e(cum_b) =  -6.1613231

added scalar:
              e(cum_s) =  .34007263

added scalar:
              e(cum_t) =  -18.117668
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
```

```
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  24,   1025) =
88.97
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0764

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                             |               Robust
                                     percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+----------------------------------------
                                      mydeg0 |     -0.871      0.109
-7.982   0.000
                                      mydeg1 |      0.120      0.116
1.040   0.298
                                      mydeg2 |     -0.022      0.034
-0.637   0.524
                                      mydeg3 |      0.002      0.003
0.556   0.578
                            temp_daily_avg |     47.923      5.909
8.111   0.000
                          precip_daily_avg |   4107.487    333.116
12.330   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -6.763      0.550
```

```
-12.291   0.000
                                                |
                            relhum_daily_avg |      3.366      3.006
1.120   0.263
                                                |
       c.temp_daily_avg#c.relhum_daily_avg |      0.022      0.005
4.545   0.000
                                                |
                             press_daily_avg |      8.511      2.178
3.907   0.000
                                                |
        c.temp_daily_avg#c.press_daily_avg |     -0.475      0.057
-8.273   0.000
                                                |
                        winddir_cos_daily_avg |   -222.278     21.863
-10.167   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.262      0.023
11.354   0.000
                                                |
                        winddir_sin_daily_avg |    289.582     23.578
12.282   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.520      0.025
-20.665   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.488      0.313
1.561   0.118
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -41.209      3.217
-12.808   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.435      0.447
-5.449   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.796      0.969
5.983   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.036      0.030
-1.197   0.231
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.015      0.011
-1.310   0.190
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.177      0.014
-12.949   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.245      0.212
10.588   0.000
                                                |
```

```
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.775      0.229
-12.118   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est7 stored)

added scalar:
             e(maxlag) =  8

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.8706492   .1090731    -7.98   0.000    -1.084429
-.6568698
------------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.8706492

added scalar:
              e(imp_s) =  .10907307

added scalar:
              e(imp_t) =  -7.9822566

 ( 1)  9*mydeg0 + 36*mydeg1 + 204*mydeg2 + 1296*mydeg3 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
```

```
+------------------------------------------------------------------
         (1) |  -5.935694   .3225675   -18.40   0.000    -6.567916
-5.303473
------------------------------------------------------------------
--------

added scalar:
              e(cum_b) =  -5.9356943

added scalar:
              e(cum_s) =  .32256754

added scalar:
              e(cum_t) =  -18.4014
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
```

```
1,806,513
Absorbing 4 HDFE groups                          F(  24,   1025) =
88.04
Statistics robust to heteroskedasticity          Prob > F        =
0.0000
                                                 R-squared       =
0.4874
                                                 Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959        Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026      Root MSE        =
441.0796

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+----------------------------------------
                                     mydeg0 |     -0.917      0.111
-8.297   0.000
                                     mydeg1 |      0.264      0.133
1.979   0.048
                                     mydeg2 |     -0.072      0.045
-1.592   0.111
                                     mydeg3 |      0.006      0.004
1.433   0.152
                            temp_daily_avg |     49.560      5.913
8.381   0.000
                          precip_daily_avg |   4074.020    334.971
12.162   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -7.102      0.546
-13.002   0.000
                                            |
                          relhum_daily_avg |      2.362      3.001
0.787   0.431
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.020      0.005
4.143   0.000
                                            |
                           press_daily_avg |      8.165      2.178
3.749   0.000
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.490      0.057
-8.523   0.000
```

```
                                                |
                     winddir_cos_daily_avg |   -229.074     21.909
-10.456   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.258      0.023
11.221   0.000
                                                |
                     winddir_sin_daily_avg |    285.032     23.568
12.094   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.515      0.025
-20.452   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.408      0.314
1.302   0.193
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -40.790      3.234
-12.614   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.462      0.447
-5.503   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.353      0.963
6.601   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.026      0.030
-0.858   0.391
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.013      0.011
-1.096   0.273
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.176      0.014
-12.908   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.311      0.212
10.878   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.731      0.229
-11.932   0.000
------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
```

```
-------------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est8 stored)

added scalar:
            e(maxlag) =  7

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |    -.91688   .1105052    -8.30   0.000    -1.133466
-.7002936
------------------------------------------------------------------------------

added scalar:
             e(imp_b) =  -.91687998

added scalar:
             e(imp_s) =  .11050523

added scalar:
             e(imp_t) =  -8.2971641

 ( 1)  8*mydeg0 + 28*mydeg1 + 140*mydeg2 + 784*mydeg3 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -5.299808   .2998375   -17.68   0.000    -5.887479
-4.712137
------------------------------------------------------------------------------

added scalar:
             e(cum_b) =  -5.2998077

added scalar:
             e(cum_s) =  .29983746

added scalar:
```

```
             e(cum_t) =  -17.675602
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  24,   1025) =
88.47
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0785
```

```
                        (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-----------------------------------------------
+-----------------------------------------
                                     mydeg0 |     -0.699      0.114
-6.109   0.000
                                     mydeg1 |     -0.248      0.171
-1.451   0.147
                                     mydeg2 |      0.170      0.069
2.470   0.014
                                     mydeg3 |     -0.023      0.008
-3.065   0.002
                           temp_daily_avg |     51.277      5.891
8.705   0.000
                         precip_daily_avg |   4200.481    336.887
12.469   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -7.434      0.548
-13.556   0.000
                                            |
                         relhum_daily_avg |      3.321      2.999
1.107   0.268
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.022      0.005
4.576   0.000
                                            |
                          press_daily_avg |      8.533      2.176
3.921   0.000
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.508      0.057
-8.878   0.000
                                            |
                     winddir_cos_daily_avg |   -223.459     21.879
-10.213   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.264      0.023
11.460   0.000
                                            |
                     winddir_sin_daily_avg |    271.739     23.596
11.516   0.000
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.510      0.025
-20.275   0.000
                                            |
```

```
     c.precip_daily_avg#c.relhum_daily_avg |      0.309      0.315
0.982   0.326
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -41.973      3.251
-12.910   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.661      0.449
-5.921   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.683      0.961
6.956   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.035      0.030
-1.186   0.235
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.008      0.011
-0.664   0.507
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.170      0.014
-12.390   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.252      0.212
10.616   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.604      0.229
-11.362   0.000
------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est9 stored)

added scalar:
             e(maxlag) =  6

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
```

```
interval]
-------------
+------------------------------------------------------------------
         (1) |  -.6993923   .1144904    -6.11   0.000    -.9237896
-.4749951
------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.69939232

added scalar:
              e(imp_s) =  .11449041

added scalar:
              e(imp_t) =  -6.1087414

 ( 1)  7*mydeg0 + 21*mydeg1 + 91*mydeg2 + 441*mydeg3 = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+------------------------------------------------------------------
         (1) |  -4.788058   .2692771   -17.78   0.000    -5.315832
-4.260285
------------------------------------------------------------------------
--------

added scalar:
              e(cum_b) =  -4.7880584

added scalar:
              e(cum_s) =  .26927713

added scalar:
              e(cum_t) =  -17.781155
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  24,   1025) =
84.60
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0903

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                          |               Robust
                                  percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                   mydeg0 |     -0.577      0.120
-4.809   0.000
                                   mydeg1 |     -0.421      0.233
```

```
-1.808   0.071
                                    mydeg2 |      0.280      0.115
2.428   0.015
                                    mydeg3 |     -0.041      0.015
-2.738   0.006
                             temp_daily_avg |     56.482      5.897
9.578   0.000
                            precip_daily_avg |   4035.904    336.491
11.994   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -7.322      0.551
-13.300   0.000
                                             |
                            relhum_daily_avg |      3.919      3.001
1.306   0.192
                                             |
       c.temp_daily_avg#c.relhum_daily_avg |      0.022      0.005
4.523   0.000
                                             |
                             press_daily_avg |      9.333      2.176
4.289   0.000
                                             |
        c.temp_daily_avg#c.press_daily_avg |     -0.560      0.057
-9.777   0.000
                                             |
                        winddir_cos_daily_avg |   -231.942     21.871
-10.605   0.000
                                             |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.256      0.023
11.108   0.000
                                             |
                        winddir_sin_daily_avg |    278.078     23.602
11.782   0.000
                                             |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.503      0.025
-19.992   0.000
                                             |
     c.precip_daily_avg#c.relhum_daily_avg |      0.394      0.315
1.249   0.212
                                             |
      c.precip_daily_avg#c.press_daily_avg |    -40.364      3.247
-12.430   0.000
                                             |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.148      0.446
-4.818   0.000
                                             |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.634      0.962
6.894   0.000
                                             |
      c.relhum_daily_avg#c.press_daily_avg |     -0.042      0.030
```

```
-1.395   0.163
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.012      0.011
-1.085   0.278
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.173      0.014
-12.625   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.338      0.212
11.027   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.665      0.229
-11.627   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est10 stored)

added scalar:
             e(maxlag) =  5

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.5766597   .1199154    -4.81   0.000    -.8116898
-.3416297
------------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.57665975

added scalar:
              e(imp_s) =  .11991541
```

```
added scalar:
              e(imp_t) =  -4.8088878

 ( 1)  6*mydeg0 + 15*mydeg1 + 55*mydeg2 + 225*mydeg3 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |  -3.704038   .2451817   -15.11   0.000    -4.184585   -3.22349
------------------------------------------------------------------------------

added scalar:
              e(cum_b) =  -3.7040375

added scalar:
              e(cum_s) =  .24518166

added scalar:
              e(cum_t) =  -15.107319
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
```

```
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  24,   1025) =
81.80
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0990

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-----------------------------------------------
+-----------------------------------------
                                     mydeg0 |     -0.674      0.123
-5.462   0.000
                                     mydeg1 |      0.696      0.319
2.183   0.029
                                     mydeg2 |     -0.517      0.199
-2.596   0.009
                                     mydeg3 |      0.091      0.032
2.811   0.005
                           temp_daily_avg |     52.835      5.889
8.972   0.000
                         precip_daily_avg |   4197.613    336.715
12.466   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.949      0.550
-12.628   0.000
                                            |
```

```
                          relhum_daily_avg |      2.825      2.999
0.942   0.346
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.021      0.005
4.324   0.000
                                           |
                           press_daily_avg |      9.047      2.176
4.158   0.000
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.524      0.057
-9.161   0.000
                                           |
                      winddir_cos_daily_avg |   -233.094     21.963
-10.613   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.266      0.023
11.523   0.000
                                           |
                      winddir_sin_daily_avg |    279.543     23.671
11.810   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.516      0.025
-20.515   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.438      0.316
1.388   0.165
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -42.038      3.249
-12.940   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.645      0.442
-3.724   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.203      0.962
7.486   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.031      0.030
-1.030   0.303
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.012      0.011
-1.091   0.275
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.178      0.014
-12.932   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.349      0.213
11.025   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.676      0.230
-11.643   0.000
```

```
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est11 stored)

added scalar:
             e(maxlag) =  4

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.6735275   .1233108    -5.46   0.000    -.9152124
-.4318425
------------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.67352748

added scalar:
              e(imp_s) =  .12331083

added scalar:
              e(imp_t) =  -5.4620302

 ( 1)  5*mydeg0 + 10*mydeg1 + 30*mydeg2 + 100*mydeg3 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -2.796369   .2268038   -12.33   0.000    -3.240896
```

```
-2.351841
------------------------------------------------------------------------------
--------

added scalar:
              e(cum_b) =  -2.7963687

added scalar:
              e(cum_s) =  .2268038

added scalar:
              e(cum_t) =  -12.329461
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  24,   1025) =
```

```
82.18
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0979

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                             |               Robust
                                     percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-------------------------------------
                                      mydeg0 |     -0.839      0.131
-6.411   0.000
                                      mydeg1 |      3.186      0.621
5.135   0.000
                                      mydeg2 |     -2.924      0.549
-5.330   0.000
                                      mydeg3 |      0.633      0.120
5.262   0.000
                            temp_daily_avg |     54.110      5.894
9.180   0.000
                          precip_daily_avg |   4305.113    333.493
12.909   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -6.783      0.552
-12.285   0.000
                                             |
                          relhum_daily_avg |      3.558      3.002
1.185   0.236
                                             |
       c.temp_daily_avg#c.relhum_daily_avg |      0.017      0.005
3.430   0.001
                                             |
                           press_daily_avg |      9.540      2.178
4.381   0.000
                                             |
        c.temp_daily_avg#c.press_daily_avg |     -0.535      0.057
-9.345   0.000
                                             |
                     winddir_cos_daily_avg |   -225.769     21.956
```

```
-10.283   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.269      0.023
11.712   0.000
                                                |
                      winddir_sin_daily_avg |    264.564     23.592
11.214   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.518      0.025
-20.566   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.308      0.314
0.979   0.327
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -43.028      3.219
-13.369   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.730      0.442
-3.915   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.451      0.961
7.749   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.038      0.030
-1.266   0.206
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.008      0.011
-0.725   0.469
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.170      0.014
-12.483   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.272      0.213
10.671   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.532      0.229
-11.049   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
```

```
* = FE nested within cluster; treated as redundant for DoF computation
(est12 stored)

added scalar:
             e(maxlag) =  3

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.8394926   .1309505    -6.41   0.000    -1.096151
-.5828343
------------------------------------------------------------------------------

added scalar:
              e(imp_b) =  -.83949263

added scalar:
              e(imp_s) =  .13095046

added scalar:
              e(imp_t) =  -6.410765

 ( 1)  4*mydeg0 + 6*mydeg1 + 14*mydeg2 + 36*mydeg3 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -2.398506   .2022619   -11.86   0.000    -2.794932
-2.00208
------------------------------------------------------------------------------

added scalar:
              e(cum_b) =  -2.398506

added scalar:
              e(cum_s) =  .20226193

added scalar:
              e(cum_t) =  -11.858415
(dropped 1175 singleton observations)
```

```
(MWFE estimator converged in 12 iterations)
note: mydeg3 omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
84.84
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1005
```

```
                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                     mydeg0 |     -0.863      0.131
-6.589   0.000
                                     mydeg1 |      2.325      0.389
5.980   0.000
                                     mydeg2 |     -1.278      0.187
-6.847   0.000
                                            |
                            temp_daily_avg |     55.639      5.886
9.453   0.000
                          precip_daily_avg |   4324.703    333.459
12.969   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.756      0.552
-12.237   0.000
                                            |
                          relhum_daily_avg |      3.510      3.002
1.169   0.242
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.015      0.005
2.965   0.003
                                            |
                           press_daily_avg |      9.393      2.178
4.314   0.000
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.549      0.057
-9.602   0.000
                                            |
                     winddir_cos_daily_avg |   -229.090     21.948
-10.438   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.269      0.023
11.682   0.000
                                            |
                     winddir_sin_daily_avg |    259.027     23.571
10.989   0.000
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.513      0.025
-20.391   0.000
                                            |
     c.precip_daily_avg#c.relhum_daily_avg |      0.291      0.314
0.926   0.354
```

```
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -43.220      3.218
-13.430   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.779      0.442
-4.027   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.472      0.961
7.771   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.037      0.030
-1.245   0.213
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.355   0.723
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.166      0.014
-12.184   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.303      0.213
10.817   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.480      0.229
-10.830   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est13 stored)

added scalar:
             e(maxlag) =  2

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
```

```
+------------------------------------------------------------------
         (1) |  -.8625883   .1309057    -6.59   0.000    -1.119159
-.6060177
-------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.86258829

added scalar:
              e(imp_s) =  .13090568

added scalar:
              e(imp_t) =  -6.5893877

 ( 1)  3*mydeg0 + 3*mydeg1 + 5*mydeg2 + 9*o.mydeg3 = 0

-------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+------------------------------------------------------------------
         (1) |  -2.000378   .1813246   -11.03   0.000    -2.355768
-1.644988
-------------------------------------------------------------------
--------

added scalar:
              e(cum_b) =  -2.0003781

added scalar:
              e(cum_s) =  .18132465

added scalar:
              e(cum_t) =  -11.032026
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: mydeg2 omitted because of collinearity
note: mydeg3 omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  22,   1025) =
81.88
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1193

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                          |               Robust
                                  percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                   mydeg0 |     -0.524      0.128
-4.101   0.000
                                   mydeg1 |      0.211      0.197
```

```
1.070   0.285
                                                |
                                temp_daily_avg |     51.946      5.883
8.831   0.000
                              precip_daily_avg |   4257.695    333.364
12.772   0.000
                                                |
       c.temp_daily_avg#c.precip_daily_avg |     -6.861      0.552
-12.432   0.000
                                                |
                              relhum_daily_avg |      0.361      2.994
0.121   0.904
                                                |
       c.temp_daily_avg#c.relhum_daily_avg |      0.014      0.005
2.834   0.005
                                                |
                               press_daily_avg |      6.507      2.168
3.001   0.003
                                                |
        c.temp_daily_avg#c.press_daily_avg |     -0.513      0.057
-8.970   0.000
                                                |
                         winddir_cos_daily_avg |   -238.466     21.951
-10.864   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.261      0.023
11.352   0.000
                                                |
                         winddir_sin_daily_avg |    272.367     23.537
11.572   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.342   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.557      0.313
1.780   0.075
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -42.761      3.218
-13.290   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.700      0.442
-3.849   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.257      0.961
7.549   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.006      0.030
-0.191   0.849
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
```

```
-0.368   0.713
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.160      0.014
-11.796   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.397      0.213
11.258   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.616      0.229
-11.445   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est14 stored)

added scalar:
             e(maxlag) =  1

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.5237176   .1277112    -4.10   0.000    -.7740271
-.2734081
------------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.52371757

added scalar:
              e(imp_s) =  .12771119

added scalar:
              e(imp_t) =  -4.1007962
```

```
 ( 1)  2*mydeg0 + mydeg1 + o.mydeg2 + o.mydeg3 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |  -.8367665   .1527592    -5.48   0.000    -1.136169   -.5373638
------------------------------------------------------------------------------

added scalar:
              e(cum_b) =  -.83676652

added scalar:
              e(cum_s) =  .15275918

added scalar:
              e(cum_t) =  -5.477684
.
. esttab using table_4_c.tex , ///
> drop(*) ///
> mgroups("Restricted Finite Distributed Cubic Lag",pattern(1 0 0 0 0
0 0) prefix(\multicolumn{@span}{c}{) suffix(}) span ) ///
> star(* 0.10 ** 0.05 *** 0.01) label ///
> stats(maxlag N cum_b cum_s cum_t imp_b imp_s imp_t, ///
> fmt(%9.0gc %9.0gc %9.2f) ///
> labels("Lags Included" "Observations" "Cumulative Effect" "S.E." "t"
"Impact Effect" "S.E." "t" ) ///
> layout("@" "@" "@" "(@)" "@" "@" "(@)" "@")) ///
> nobase mtitles() nomtitles ///
> compress se(3) b(3) replace nogaps noomitted ///
> nonotes
(file table_4_c.tex not found)
(output written to table_4_c.tex)
.
. log close
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_4c.log
  log type:  text
 closed on:  23 Feb 2023, 12:06:35
------------------------------------------------------------------------------
------------------------------------------------------------
------------------------------------------------------------------------------
------------------------------------------------------------
      name:  <unnamed>
```

```
      log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_4d.log
  log type:  text
 opened on:  23 Feb 2023, 12:06:35
. * table_4_d
. eststo clear
.
. capture drop pdl_ml_*
. forval s = 0(1)4 {
  2.          gen pdl_ml_1_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day
  3.          gen pdl_ml_2_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day
  4.          gen pdl_ml_3_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day
  5.          gen pdl_ml_4_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day +
4^`s'*p
> m25_lag_4_day
  6.          gen pdl_ml_5_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day +
4^`s'*p
> m25_lag_4_day + 5^`s'*pm25_lag_5_day
  7.          gen pdl_ml_6_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day +
4^`s'*p
> m25_lag_4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day
  8.          gen pdl_ml_7_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day +
4^`s'*p
> m25_lag_4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day
  9.          gen pdl_ml_8_d_`s' = 0^`s'*pm25_pref +
1^`s'*pm25_lag_1_day + 2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day +
4^`s'*p
> m25_lag_4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day
 10. gen pdl_ml_9_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_4
> _day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day
 11. gen pdl_ml_10_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_
> 4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day +
10^`s'*pm25_lag_10_day
 12. gen pdl_ml_11_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
```

```
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_
> 4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day +
10^`s'*pm25_lag_10_day + 11^`s'*pm25_lag_11_day
 13. gen pdl_ml_12_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_
> 4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day +
10^`s'*pm25_lag_10_day + 11^`s'*pm25_lag_11_day +
12^`s'*pm25_lag_12_da
> y
 14. gen pdl_ml_13_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_
> 4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day +
10^`s'*pm25_lag_10_day + 11^`s'*pm25_lag_11_day +
12^`s'*pm25_lag_12_da
> y + 13^`s'*pm25_lag_13_day
 15. gen pdl_ml_14_d_`s' = 0^`s'*pm25_pref + 1^`s'*pm25_lag_1_day +
2^`s'*pm25_lag_2_day + 3^`s'*pm25_lag_3_day + 4^`s'*pm25_lag_
> 4_day + 5^`s'*pm25_lag_5_day + 6^`s'*pm25_lag_6_day +
7^`s'*pm25_lag_7_day ///
>         + 8^`s'*pm25_lag_8_day + 9^`s'*pm25_lag_9_day +
10^`s'*pm25_lag_10_day + 11^`s'*pm25_lag_11_day +
12^`s'*pm25_lag_12_da
> y + 13^`s'*pm25_lag_13_day + 14^`s'*pm25_lag_14_day
 16. }
.
. forval i = 14(-1)1 {
  2.         capture drop mydeg0
  3.         capture drop mydeg1
  4.         capture drop mydeg2
  5.         capture drop mydeg3
  6.         capture drop mydeg4
  7.         gen mydeg0 = pdl_ml_`i'_d_0
  8.         gen mydeg1 = pdl_ml_`i'_d_1
  9.         gen mydeg2 = pdl_ml_`i'_d_2
 10.         gen mydeg3 = pdl_ml_`i'_d_3
 11.         gen mydeg4 = pdl_ml_`i'_d_4
 12.
.         eststo: reghdfe percent mydeg0 mydeg1 mydeg2 mydeg3 mydeg4
`controls2' , absorb(`absorb1') vce(clust `cluster') `displa
> y_options'
 13.
.         estadd scalar maxlag = `i'
 14.
.         lincom mydeg0 + 0 * mydeg1 + 0* mydeg2 + 0*mydeg3+0*mydeg4
```

```
 15.         estadd scalar imp_b = r(estimate)
 16.         estadd scalar imp_s = r(se)
 17.         estadd scalar imp_t = r(estimate) /r(se)
 18.
.         local j = (`i'*(`i'+1)) /2
 19.
.         local k = (`i'*(`i'+1)*(2*`i'+1)) /6
 20.
.         local l = (`i'^2)*((`i'+1)^2) /4
 21.
.         local m = ( (`i')*(`i'+1)*(2*`i'+1)*(3*(`i'^2)+3*(`i')-1) /
30)
 22.
.         lincom (`i'+1)*mydeg0+(`j')*mydeg1+(`k')*mydeg2+
(`l')*mydeg3+(`m')*mydeg4
 23.         estadd scalar cum_b = r(estimate)
 24.         estadd scalar cum_s = r(se)
 25.         estadd scalar cum_t = r(estimate) /r(se)
 26.
. }
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
```

```
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  25,   1025) =
88.18
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0680

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
             |                Robust
             |    percent | Coefficient  std. err.
t    P>|t|
-------------+----------------------------------------
+----------------------------------------
             |      mydeg0 |     -0.960      0.101
-9.533   0.000
             |      mydeg1 |      0.126      0.092
1.369   0.171
             |      mydeg2 |     -0.029      0.028
-1.036   0.300
             |      mydeg3 |      0.003      0.003
1.016   0.310
             |      mydeg4 |     -0.000      0.000
-0.852   0.394
             |  temp_daily_avg |     44.974      5.953
7.555   0.000
             | precip_daily_avg |   4181.556    332.655
12.570   0.000
             |                 |
c.temp_daily_avg#c.precip_daily_avg |     -7.044      0.554
-12.715   0.000
             |                 |
             | relhum_daily_avg |      2.853      3.001
0.951   0.342
             |                 |
```

```
       c.temp_daily_avg#c.relhum_daily_avg |      0.026      0.005
5.436   0.000
                                           |
                           press_daily_avg |      7.923      2.179
3.635   0.000
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.448      0.058
-7.744   0.000
                                           |
                      winddir_cos_daily_avg |   -205.730     22.218
-9.259   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.240      0.023
10.298   0.000
                                           |
                      winddir_sin_daily_avg |    292.559     23.664
12.363   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.525      0.025
-20.873   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.424      0.313
1.356   0.175
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -41.889      3.213
-13.039   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.313      0.449
-5.153   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.362      0.969
5.536   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.031      0.030
-1.041   0.298
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.019      0.012
-1.665   0.096
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.174      0.014
-12.720   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.083      0.215
9.668   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.806      0.230
-12.206   0.000
------------------------------------------------------------------------
-------------
```

```
Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est1 stored)

added scalar:
            e(maxlag) =  14

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.9603737   .1007462    -9.53   0.000    -1.157833
-.7629146
------------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.96037372

added scalar:
              e(imp_s) =  .10074621

added scalar:
              e(imp_t) =  -9.5326042

 ( 1)  15*mydeg0 + 105*mydeg1 + 1015*mydeg2 + 11025*mydeg3 +
127687*mydeg4 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -8.120212   .5976045   -13.59   0.000    -9.291496
-6.948928
------------------------------------------------------------------------------
```

```
--------

added scalar:
              e(cum_b) =  -8.1202117

added scalar:
              e(cum_s) =  .59760453

added scalar:
              e(cum_t) =  -13.587935
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  25,   1025) =
89.07
Statistics robust to heteroskedasticity           Prob > F        =
```

```
0.0000
                                                R-squared       =
0.4875
                                                Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959       Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026     Root MSE        =
441.0650

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
--------------------------------------------
+-----------------------------------
                                     mydeg0 |     -0.847      0.103
-8.235   0.000
                                     mydeg1 |     -0.092      0.102
-0.900   0.368
                                     mydeg2 |      0.061      0.033
1.866   0.062
                                     mydeg3 |     -0.009      0.004
-2.342   0.019
                                     mydeg4 |      0.000      0.000
2.821   0.005
                           temp_daily_avg |     43.866      5.954
7.368   0.000
                         precip_daily_avg |   4255.495    332.583
12.795   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -7.177      0.553
-12.984   0.000
                                            |
                         relhum_daily_avg |      3.212      2.996
1.072   0.284
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.032      0.005
6.470   0.000
                                            |
                          press_daily_avg |      8.079      2.175
3.714   0.000
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.441      0.058
-7.620   0.000
                                            |
                    winddir_cos_daily_avg |   -201.105     21.999
```

```
-9.141   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.238      0.023
10.262   0.000
                                                |
                      winddir_sin_daily_avg |    291.663     23.583
12.367   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.527      0.025
-20.981   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.402      0.313
1.287   0.198
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -42.606      3.212
-13.266   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.194      0.449
-4.885   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.194      0.968
5.364   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.035      0.030
-1.180   0.238
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.020      0.011
-1.773   0.076
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.173      0.014
-12.644   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.038      0.213
9.552   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.797      0.229
-12.212   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
```

```
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)

added scalar:
            e(maxlag) =  13

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.8471834   .1028709    -8.24   0.000    -1.048807
-.6455599
------------------------------------------------------------------------------

added scalar:
              e(imp_b) =  -.84718335

added scalar:
              e(imp_s) =  .10287093

added scalar:
              e(imp_t) =  -8.2354007

 ( 1)  14*mydeg0 + 91*mydeg1 + 819*mydeg2 + 8281*mydeg3 + 89271*mydeg4
= 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -7.662177   .5332832   -14.37   0.000    -8.707393
-6.61696
------------------------------------------------------------------------------

added scalar:
              e(cum_b) =  -7.6621765

added scalar:
              e(cum_s) =  .53328325

added scalar:
              e(cum_t) =  -14.36793
```

```
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  25,   1025) =
88.61
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0666
```

```
                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
             |               Robust
             |      percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------
             |       mydeg0 |     -0.893      0.110
-8.085   0.000
             |       mydeg1 |     -0.038      0.121
-0.317   0.751
             |       mydeg2 |      0.035      0.042
0.830   0.406
             |       mydeg3 |     -0.005      0.005
-0.965   0.335
             |       mydeg4 |      0.000      0.000
1.092   0.275
             |  temp_daily_avg |     45.147      6.027
7.490   0.000
             | precip_daily_avg |   4233.397    334.956
12.639   0.000
             |
c.temp_daily_avg#c.precip_daily_avg |     -7.151      0.557
-12.838   0.000
             |
             | relhum_daily_avg |      3.131      2.999
1.044   0.296
             |
c.temp_daily_avg#c.relhum_daily_avg |      0.029      0.005
5.839   0.000
             |
             |  press_daily_avg |      8.085      2.175
3.717   0.000
             |
 c.temp_daily_avg#c.press_daily_avg |     -0.452      0.059
-7.715   0.000
             |
             | winddir_cos_daily_avg |   -206.509     21.953
-9.407   0.000
             |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.236      0.023
10.161   0.000
             |
             | winddir_sin_daily_avg |    294.557     23.567
12.498   0.000
             |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.528      0.025
-20.998   0.000
```

```
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.397      0.314
1.267   0.205
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -42.379      3.234
-13.103   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.201      0.450
-4.894   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.333      0.969
5.502   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.034      0.030
-1.143   0.253
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.019      0.011
-1.678   0.093
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.174      0.014
-12.731   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.091      0.213
9.821   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.825      0.229
-12.342   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est3 stored)

added scalar:
             e(maxlag) =  12

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
```

```
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+------------------------------------------------------------------
         (1) |  -.8932955   .1104875    -8.09   0.000    -1.109847
-.6767438
------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.8932955

added scalar:
              e(imp_s) =  .11048752

added scalar:
              e(imp_t) =  -8.0850355

 ( 1)  13*mydeg0 + 78*mydeg1 + 650*mydeg2 + 6084*mydeg3 + 60710*mydeg4
= 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+------------------------------------------------------------------
         (1) |  -8.564551   .4867749   -17.59   0.000    -9.518613
-7.610489
------------------------------------------------------------------------
--------

added scalar:
              e(cum_b) =  -8.5645511

added scalar:
              e(cum_s) =  .48677495

added scalar:
              e(cum_t) =  -17.594478
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  25,   1025) =
88.61
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0666

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                          |               Robust
                                  percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                   mydeg0 |     -0.922      0.116
```

```
-7.972   0.000
                                    mydeg1 |      0.063      0.144
0.440   0.660
                                    mydeg2 |     -0.012      0.055
-0.215   0.829
                                    mydeg3 |      0.002      0.008
0.273   0.785
                                    mydeg4 |     -0.000      0.000
-0.324   0.746
                      temp_daily_avg |     44.380      5.968
7.437   0.000
                     precip_daily_avg |   4239.502    334.957
12.657   0.000
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -7.086      0.553
-12.822   0.000
                                           |
                     relhum_daily_avg |      2.990      3.003
0.996   0.319
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.029      0.005
5.837   0.000
                                           |
                      press_daily_avg |      7.935      2.178
3.644   0.000
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.444      0.058
-7.660   0.000
                                           |
                  winddir_cos_daily_avg |   -205.807     21.947
-9.377   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.234      0.023
10.029   0.000
                                           |
                  winddir_sin_daily_avg |    292.605     23.579
12.409   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.524      0.025
-20.789   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.382      0.313
1.218   0.223
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -42.429      3.235
-13.117   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.292      0.447
-5.127   0.000
                                           |
```

```
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.345      0.969
5.516   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.033      0.030
-1.095   0.274
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.019      0.011
-1.638   0.101
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.171      0.014
-12.541   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.084      0.213
9.791   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.807      0.229
-12.258   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est4 stored)

added scalar:
             e(maxlag) =  11

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.9221259   .1156687    -7.97   0.000    -1.148833
-.6954194
------------------------------------------------------------------------------
--------

added scalar:
```

```
              e(imp_b) =  -.92212594

added scalar:
              e(imp_s) =  .11566867

added scalar:
              e(imp_t) =  -7.9721325

 ( 1)  12*mydeg0 + 66*mydeg1 + 506*mydeg2 + 4356*mydeg3 + 39974*mydeg4
= 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------------
         (1) |  -8.298949   .4283663   -19.37   0.000    -9.138532
-7.459366
------------------------------------------------------------------------
--------

added scalar:
              e(cum_b) =  -8.2989488

added scalar:
              e(cum_s) =  .4283663

added scalar:
              e(cum_t) =  -19.373487
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
```

```
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  25,   1025) =
90.13
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0621

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                     mydeg0 |     -1.055      0.117
-9.013   0.000
                                     mydeg1 |      0.614      0.168
3.647   0.000
                                     mydeg2 |     -0.307      0.072
-4.260   0.000
                                     mydeg3 |      0.053      0.011
4.818   0.000
                                     mydeg4 |     -0.003      0.001
-5.228   0.000
                            temp_daily_avg |     42.540      5.957
```

```
7.141   0.000
                          precip_daily_avg |   4194.653    334.864
12.526   0.000
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -7.048      0.549
-12.828   0.000
                                           |
                          relhum_daily_avg |      2.108      3.007
0.701   0.483
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.024      0.005
4.927   0.000
                                           |
                           press_daily_avg |      7.415      2.180
3.401   0.001
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.422      0.058
-7.300   0.000
                                           |
                      winddir_cos_daily_avg |   -201.522     21.962
-9.176   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.231      0.023
9.952   0.000
                                           |
                      winddir_sin_daily_avg |    296.117     23.579
12.559   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.525      0.025
-20.847   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.387      0.313
1.234   0.217
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -41.996      3.234
-12.987   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.430      0.447
-5.438   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.183      0.969
5.348   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.024      0.030
-0.794   0.427
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.020      0.011
-1.789   0.074
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.172      0.014
```

```
-12.613   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.043      0.213
9.593   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.843      0.229
-12.415   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est5 stored)

added scalar:
             e(maxlag) =  10

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -1.054725   .1170187    -9.01   0.000    -1.284077
-.8253719
------------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -1.0547245

added scalar:
              e(imp_s) =  .11701872

added scalar:
              e(imp_t) =  -9.0132973

 ( 1)  11*mydeg0 + 55*mydeg1 + 385*mydeg2 + 3025*mydeg3 + 25333*mydeg4
= 0
```

```
------------------------------------------------------------------------------
-------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |   -7.79193      .3728   -20.90   0.000    -8.522605
-7.061255
------------------------------------------------------------------------------
-------

added scalar:
              e(cum_b) =  -7.79193

added scalar:
              e(cum_s) =  .37280005

added scalar:
              e(cum_t) =  -20.901097
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
```

```
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  25,   1025) =
85.62
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0760

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------+----------------------------------
                                     mydeg0 |     -0.849      0.116
-7.296   0.000
                                     mydeg1 |      0.087      0.186
0.468   0.640
                                     mydeg2 |     -0.007      0.089
-0.081   0.936
                                     mydeg3 |     -0.001      0.015
-0.098   0.922
                                     mydeg4 |      0.000      0.001
0.271   0.786
                           temp_daily_avg |     46.440      5.948
7.808   0.000
                         precip_daily_avg |   4144.683    335.170
12.366   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.739      0.550
-12.258   0.000
                                            |
                         relhum_daily_avg |      3.661      3.006
1.218   0.223
                                            |
```

```
       c.temp_daily_avg#c.relhum_daily_avg |      0.023      0.005
4.699   0.000
                                           |
                           press_daily_avg |      8.621      2.177
3.960   0.000
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.461      0.058
-7.983   0.000
                                           |
                      winddir_cos_daily_avg |   -217.433     22.040
-9.865   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.260      0.023
11.285   0.000
                                           |
                      winddir_sin_daily_avg |    289.544     23.566
12.287   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.522      0.025
-20.709   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.450      0.313
1.437   0.151
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -41.556      3.237
-12.840   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.491      0.447
-5.576   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.791      0.967
5.987   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.039      0.030
-1.298   0.194
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.016      0.011
-1.356   0.175
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.177      0.014
-12.975   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.197      0.214
10.277   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.774      0.229
-12.121   0.000
------------------------------------------------------------------------
-------------
```

```
Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est6 stored)

added scalar:
            e(maxlag) =  9

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
-------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.8486801   .1163267    -7.30   0.000    -1.076676
-.6206838
------------------------------------------------------------------------------
-------

added scalar:
              e(imp_b) =  -.84868011

added scalar:
              e(imp_s) =  .1163267

added scalar:
              e(imp_t) =  -7.2956603

 ( 1)  10*mydeg0 + 45*mydeg1 + 285*mydeg2 + 2025*mydeg3 + 15333*mydeg4
= 0

------------------------------------------------------------------------------
-------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -6.159625   .3402161   -18.11   0.000    -6.826437
-5.492813
------------------------------------------------------------------------------
```

```
--------

added scalar:
              e(cum_b) =  -6.1596252

added scalar:
              e(cum_s) =  .3402161

added scalar:
              e(cum_t) =  -18.105037
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  25,   1025) =
85.41
Statistics robust to heteroskedasticity           Prob > F        =
```

```
0.0000
                                                R-squared       =
0.4874
                                                Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959       Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026     Root MSE        =
441.0765

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                          |               Robust
                                  percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                   mydeg0 |     -0.881      0.118
-7.482   0.000
                                   mydeg1 |      0.162      0.217
0.746   0.456
                                   mydeg2 |     -0.048      0.119
-0.401   0.689
                                   mydeg3 |      0.007      0.023
0.292   0.770
                                   mydeg4 |     -0.000      0.001
-0.225   0.822
                            temp_daily_avg |     47.967      5.910
8.116   0.000
                          precip_daily_avg |   4096.433    336.415
12.177   0.000
                                          |
       c.temp_daily_avg#c.precip_daily_avg |     -6.746      0.556
-12.134   0.000
                                          |
                          relhum_daily_avg |      3.397      3.008
1.129   0.259
                                          |
       c.temp_daily_avg#c.relhum_daily_avg |      0.022      0.005
4.435   0.000
                                          |
                           press_daily_avg |      8.531      2.179
3.915   0.000
                                          |
        c.temp_daily_avg#c.press_daily_avg |     -0.475      0.057
-8.278   0.000
                                          |
                     winddir_cos_daily_avg |   -221.833     21.952
```

```
-10.106   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.261      0.023
11.345   0.000
                                                |
                      winddir_sin_daily_avg |    289.727     23.587
12.283   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.520      0.025
-20.664   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.498      0.316
1.576   0.115
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -41.107      3.246
-12.662   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.435      0.447
-5.449   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.793      0.969
5.979   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.036      0.030
-1.206   0.228
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.015      0.011
-1.319   0.187
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.177      0.014
-12.946   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.240      0.213
10.525   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.776      0.229
-12.119   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
```

```
* = FE nested within cluster; treated as redundant for DoF computation
(est7 stored)

added scalar:
            e(maxlag) =  8

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.8807948   .1177235    -7.48   0.000    -1.111529
-.6500608
------------------------------------------------------------------------------

added scalar:
              e(imp_b) =  -.88079481

added scalar:
              e(imp_s) =  .11772352

added scalar:
              e(imp_t) =  -7.4818934

 ( 1)  9*mydeg0 + 36*mydeg1 + 204*mydeg2 + 1296*mydeg3 + 8772*mydeg4 =
0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -5.940212   .3232381   -18.38   0.000    -6.573747
-5.306676
------------------------------------------------------------------------------

added scalar:
              e(cum_b) =  -5.9402119

added scalar:
              e(cum_s) =  .32323812

added scalar:
              e(cum_t) =  -18.377201
```

```
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  25,   1025) =
84.76
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0790
```

```
                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                             |               Robust
                                     percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-------------------------------------
                                      mydeg0 |     -0.776      0.125
-6.209   0.000
                                      mydeg1 |     -0.342      0.290
-1.180   0.238
                                      mydeg2 |      0.349      0.186
1.877   0.061
                                      mydeg3 |     -0.089      0.041
-2.167   0.030
                                      mydeg4 |      0.007      0.003
2.322   0.020
                            temp_daily_avg |     50.266      5.921
8.490   0.000
                          precip_daily_avg |   4152.969    336.557
12.340   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -7.301      0.552
-13.217   0.000
                                             |
                          relhum_daily_avg |      2.668      3.003
0.889   0.374
                                             |
       c.temp_daily_avg#c.relhum_daily_avg |      0.022      0.005
4.493   0.000
                                             |
                           press_daily_avg |      8.215      2.178
3.772   0.000
                                             |
        c.temp_daily_avg#c.press_daily_avg |     -0.498      0.058
-8.650   0.000
                                             |
                     winddir_cos_daily_avg |   -229.328     21.908
-10.468   0.000
                                             |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.260      0.023
11.288   0.000
                                             |
                     winddir_sin_daily_avg |    280.575     23.649
11.864   0.000
                                             |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.512      0.025
-20.307   0.000
```

```
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.342      0.315
1.085   0.278
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -41.523      3.248
-12.784   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.553      0.449
-5.679   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.360      0.963
6.608   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.029      0.030
-0.964   0.335
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.011      0.011
-0.917   0.359
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.173      0.014
-12.605   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.313      0.212
10.885   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.689      0.230
-11.709   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est8 stored)

added scalar:
            e(maxlag) =  7

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
```

```
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+------------------------------------------------------------------
         (1) |   -.775641   .1249262    -6.21   0.000    -1.020492
-.5307901
-------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.77564103

added scalar:
              e(imp_s) =  .12492616

added scalar:
              e(imp_t) =  -6.208796

 ( 1)  8*mydeg0 + 28*mydeg1 + 140*mydeg2 + 784*mydeg3 + 4676*mydeg4 =
0

-------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+------------------------------------------------------------------
         (1) |  -5.204175   .3023446   -17.21   0.000     -5.79676
-4.61159
-------------------------------------------------------------------
--------

added scalar:
              e(cum_b) =  -5.2041753

added scalar:
              e(cum_s) =  .30234462

added scalar:
              e(cum_t) =  -17.212726
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  25,   1025) =
85.11
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0780

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                          |               Robust
                                  percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                   mydeg0 |     -0.809      0.125
```

```
-6.452   0.000
                                    mydeg1 |      0.441      0.366
1.207   0.228
                                    mydeg2 |     -0.399      0.276
-1.445   0.148
                                    mydeg3 |      0.127      0.071
1.792   0.073
                                    mydeg4 |     -0.012      0.006
-2.131   0.033
                           temp_daily_avg |     50.170      5.913
8.485   0.000
                         precip_daily_avg |   4189.248    336.890
12.435   0.000
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -7.300      0.552
-13.235   0.000
                                           |
                         relhum_daily_avg |      3.180      2.999
1.060   0.289
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.021      0.005
4.250   0.000
                                           |
                          press_daily_avg |      8.511      2.176
3.910   0.000
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.496      0.057
-8.632   0.000
                                           |
                     winddir_cos_daily_avg |   -220.419     21.917
-10.057   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.266      0.023
11.516   0.000
                                           |
                     winddir_sin_daily_avg |    271.774     23.597
11.518   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.513      0.025
-20.376   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.335      0.315
1.063   0.288
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -41.889      3.251
-12.884   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.647      0.449
-5.888   0.000
                                           |
```

```
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.805      0.963
7.065   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.034      0.030
-1.135   0.256
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.008      0.011
-0.689   0.491
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.171      0.014
-12.476   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.222      0.213
10.455   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.603      0.229
-11.360   0.000
------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est9 stored)

added scalar:
             e(maxlag) =  6

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.8093429   .1254429    -6.45   0.000    -1.055207
-.5634793
------------------------------------------------------------------------
--------

added scalar:
```

```
              e(imp_b) =  -.80934294

added scalar:
              e(imp_s) =  .12544285

added scalar:
              e(imp_t) =  -6.4518856

 ( 1)  7*mydeg0 + 21*mydeg1 + 91*mydeg2 + 441*mydeg3 + 2275*mydeg4 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |  -4.823288    .269866   -17.87   0.000    -5.352216   -4.294359
------------------------------------------------------------------------------

added scalar:
              e(cum_b) =  -4.8232875

added scalar:
              e(cum_s) =  .26986601

added scalar:
              e(cum_t) =  -17.872897
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
```

```
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  25,   1025) =
82.70
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0855

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                          |               Robust
                                  percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                   mydeg0 |     -0.825      0.127
-6.519   0.000
                                   mydeg1 |      2.192      0.482
4.552   0.000
                                   mydeg2 |     -2.390      0.445
-5.366   0.000
                                   mydeg3 |      0.813      0.138
5.875   0.000
                                   mydeg4 |     -0.085      0.014
-6.216   0.000
                           temp_daily_avg |     56.522      5.897
9.585   0.000
```

```
                          precip_daily_avg |   4076.523    336.627
12.110   0.000
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -7.115      0.551
-12.902   0.000
                                           |
                          relhum_daily_avg |      4.806      3.004
1.600   0.110
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.018      0.005
3.545   0.000
                                           |
                           press_daily_avg |      9.921      2.177
4.557   0.000
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.558      0.057
-9.741   0.000
                                           |
                      winddir_cos_daily_avg |   -215.486     22.008
-9.791   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.259      0.023
11.239   0.000
                                           |
                      winddir_sin_daily_avg |    264.623     23.704
11.164   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.506      0.025
-20.088   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.281      0.316
0.890   0.374
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -40.697      3.248
-12.529   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.330      0.447
-5.216   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.864      0.963
7.125   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.050      0.030
-1.681   0.093
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.012      0.011
-1.062   0.288
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.166      0.014
-12.092   0.000
```

```
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.174      0.213
10.184   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.536      0.230
-11.018   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est10 stored)

added scalar:
             e(maxlag) =  5

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.8254285   .1266244    -6.52   0.000    -1.073608
-.5772491
------------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.82542854

added scalar:
              e(imp_s) =  .12662439

added scalar:
              e(imp_t) =  -6.5187167

 ( 1)  6*mydeg0 + 15*mydeg1 + 55*mydeg2 + 225*mydeg3 + 979*mydeg4 = 0

------------------------------------------------------------------------------
```

```
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+------------------------------------------------------------------
         (1) |  -3.722389    .245194   -15.18   0.000    -4.202961
-3.241818
------------------------------------------------------------------------
--------

added scalar:
              e(cum_b) =  -3.7223894

added scalar:
              e(cum_s) =  .24519396

added scalar:
              e(cum_t) =  -15.181407
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
```

```
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  25,   1025) =
80.00
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0945

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
             |                Robust
             |    percent | Coefficient  std. err.
t    P>|t|
-------------+----------------------------------------
+----------------------------------
             |
             |
             |
```

```
                                                 |
                            press_daily_avg |      9.938      2.179
4.561   0.000
                                                 |
        c.temp_daily_avg#c.press_daily_avg |     -0.543      0.057
-9.487   0.000
                                                 |
                       winddir_cos_daily_avg |   -229.405     21.968
-10.443   0.000
                                                 |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.263      0.023
11.397   0.000
                                                 |
                       winddir_sin_daily_avg |    274.826     23.682
11.605   0.000
                                                 |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.524      0.025
-20.781   0.000
                                                 |
     c.precip_daily_avg#c.relhum_daily_avg |      0.461      0.316
1.461   0.144
                                                 |
      c.precip_daily_avg#c.press_daily_avg |    -40.530      3.258
-12.442   0.000
                                                 |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.767      0.442
-3.996   0.000
                                                 |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.309      0.962
7.595   0.000
                                                 |
      c.relhum_daily_avg#c.press_daily_avg |     -0.042      0.030
-1.399   0.162
                                                 |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.010      0.011
-0.871   0.384
                                                 |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.180      0.014
-13.098   0.000
                                                 |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.310      0.213
10.842   0.000
                                                 |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.628      0.230
-11.425   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
```

```
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est11 stored)

added scalar:
             e(maxlag) =  4

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.9976842   .1344051    -7.42   0.000    -1.261114
-.7342549
------------------------------------------------------------------------------

added scalar:
              e(imp_b) =  -.9976842

added scalar:
              e(imp_s) =  .1344051

added scalar:
              e(imp_t) =  -7.4229636

 ( 1)  5*mydeg0 + 10*mydeg1 + 30*mydeg2 + 100*mydeg3 + 354*mydeg4 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -2.955868   .2281641   -12.96   0.000    -3.403062
-2.508674
------------------------------------------------------------------------------

added scalar:
```

```
              e(cum_b) =  -2.9558682

added scalar:
              e(cum_s) =  .22816412

added scalar:
              e(cum_t) =  -12.955009
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: mydeg4 omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  24,   1025) =
82.18
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
```

```
0.4874
                                                Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959       Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026     Root MSE        =
441.0979

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                     mydeg0 |     -0.839      0.131
-6.411   0.000
                                     mydeg1 |      3.186      0.621
5.135   0.000
                                     mydeg2 |     -2.924      0.549
-5.330   0.000
                                     mydeg3 |      0.633      0.120
5.262   0.000
                                            |
                              temp_daily_avg |     54.110      5.894
9.180   0.000
                             precip_daily_avg |   4305.113    333.493
12.909   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.783      0.552
-12.285   0.000
                                            |
                             relhum_daily_avg |      3.558      3.002
1.185   0.236
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.017      0.005
3.430   0.001
                                            |
                              press_daily_avg |      9.540      2.178
4.381   0.000
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.535      0.057
-9.345   0.000
                                            |
                        winddir_cos_daily_avg |   -225.769     21.956
-10.283   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.269      0.023
```

```
11.712   0.000
                                                |
                        winddir_sin_daily_avg |    264.564     23.592
11.214   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.518      0.025
-20.566   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.308      0.314
0.979   0.327
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -43.028      3.219
-13.369   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.730      0.442
-3.915   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.451      0.961
7.749   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.038      0.030
-1.266   0.206
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.008      0.011
-0.725   0.469
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.170      0.014
-12.483   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.272      0.213
10.671   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.532      0.229
-11.049   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est12 stored)
```

```
added scalar:
             e(maxlag) =  3

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |  -.8394926   .1309505    -6.41   0.000    -1.096151   -.5828343
------------------------------------------------------------------------------

added scalar:
              e(imp_b) =  -.83949263

added scalar:
              e(imp_s) =  .13095046

added scalar:
              e(imp_t) =  -6.410765

 ( 1)  4*mydeg0 + 6*mydeg1 + 14*mydeg2 + 36*mydeg3 + 98*o.mydeg4 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |  -2.398506   .2022619   -11.86   0.000    -2.794932   -2.00208
------------------------------------------------------------------------------

added scalar:
              e(cum_b) =  -2.398506

added scalar:
              e(cum_s) =  .20226193

added scalar:
              e(cum_t) =  -11.858415
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: mydeg3 omitted because of collinearity
note: mydeg4 omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
84.84
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1005

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
```

```
------------------------------------------------------------------------------
             |               Robust
     percent | Coefficient  std. err.      t    P>|t|
-------------+----------------------------------------------------------------
-------------+
      mydeg0 |     -0.863      0.131     -6.589   0.000
      mydeg1 |      2.325      0.389      5.980   0.000
      mydeg2 |     -1.278      0.187     -6.847   0.000
             |
temp_daily_avg |     55.639      5.886      9.453   0.000
precip_daily_avg |   4324.703    333.459     12.969   0.000
             |
c.temp_daily_avg#c.precip_daily_avg |     -6.756      0.552    -12.237   0.000
             |
relhum_daily_avg |      3.510      3.002      1.169   0.242
             |
c.temp_daily_avg#c.relhum_daily_avg |      0.015      0.005      2.965   0.003
             |
press_daily_avg |      9.393      2.178      4.314   0.000
             |
c.temp_daily_avg#c.press_daily_avg |     -0.549      0.057     -9.602   0.000
             |
winddir_cos_daily_avg |   -229.090     21.948    -10.438   0.000
             |
c.temp_daily_avg#c.winddir_cos_daily_avg |      0.269      0.023     11.682   0.000
             |
winddir_sin_daily_avg |    259.027     23.571     10.989   0.000
             |
c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.513      0.025    -20.391   0.000
             |
c.precip_daily_avg#c.relhum_daily_avg |      0.291      0.314      0.926   0.354
             |
c.precip_daily_avg#c.press_daily_avg |    -43.220      3.218
```

```
-13.430   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.779      0.442
-4.027   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.472      0.961
7.771   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.037      0.030
-1.245   0.213
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.355   0.723
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.166      0.014
-12.184   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.303      0.213
10.817   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.480      0.229
-10.830   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est13 stored)

added scalar:
             e(maxlag) =  2

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.8625883   .1309057    -6.59   0.000    -1.119159
```

```
-.6060177
------------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.86258829

added scalar:
              e(imp_s) =  .13090568

added scalar:
              e(imp_t) =  -6.5893877

 ( 1)  3*mydeg0 + 3*mydeg1 + 5*mydeg2 + 9*o.mydeg3 + 17*o.mydeg4 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -2.000378   .1813246   -11.03   0.000    -2.355768
-1.644988
------------------------------------------------------------------------------
--------

added scalar:
              e(cum_b) =  -2.0003781

added scalar:
              e(cum_s) =  .18132465

added scalar:
              e(cum_t) =  -11.032026
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: mydeg2 omitted because of collinearity
note: mydeg3 omitted because of collinearity
note: mydeg4 omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
```

```
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  22,   1025) =
81.88
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1193

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-----------------------------------------------
+-----------------------------------------
                                     mydeg0 |     -0.524      0.128
-4.101   0.000
                                     mydeg1 |      0.211      0.197
1.070   0.285
```

```
                                                 |
                              temp_daily_avg |     51.946      5.883
8.831   0.000
                            precip_daily_avg |   4257.695    333.364
12.772   0.000
                                                 |
       c.temp_daily_avg#c.precip_daily_avg |     -6.861      0.552
-12.432   0.000
                                                 |
                            relhum_daily_avg |      0.361      2.994
0.121   0.904
                                                 |
       c.temp_daily_avg#c.relhum_daily_avg |      0.014      0.005
2.834   0.005
                                                 |
                             press_daily_avg |      6.507      2.168
3.001   0.003
                                                 |
        c.temp_daily_avg#c.press_daily_avg |     -0.513      0.057
-8.970   0.000
                                                 |
                        winddir_cos_daily_avg |   -238.466     21.951
-10.864   0.000
                                                 |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.261      0.023
11.352   0.000
                                                 |
                        winddir_sin_daily_avg |    272.367     23.537
11.572   0.000
                                                 |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.342   0.000
                                                 |
     c.precip_daily_avg#c.relhum_daily_avg |      0.557      0.313
1.780   0.075
                                                 |
      c.precip_daily_avg#c.press_daily_avg |    -42.761      3.218
-13.290   0.000
                                                 |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.700      0.442
-3.849   0.000
                                                 |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.257      0.961
7.549   0.000
                                                 |
      c.relhum_daily_avg#c.press_daily_avg |     -0.006      0.030
-0.191   0.849
                                                 |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.368   0.713
```

```
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.160      0.014
-11.796   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.397      0.213
11.258   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.616      0.229
-11.445   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est14 stored)

added scalar:
             e(maxlag) =  1

 ( 1)  mydeg0 = 0

------------------------------------------------------------------------------
--------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf.
interval]
-------------
+----------------------------------------------------------------
         (1) |  -.5237176   .1277112    -4.10   0.000    -.7740271
-.2734081
------------------------------------------------------------------------------
--------

added scalar:
              e(imp_b) =  -.52371757

added scalar:
              e(imp_s) =  .12771119

added scalar:
              e(imp_t) =  -4.1007962
```

```
 ( 1)  2*mydeg0 + mydeg1 + o.mydeg2 + o.mydeg3 + o.mydeg4 = 0

------------------------------------------------------------------------------
     percent | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
         (1) |  -.8367665   .1527592    -5.48   0.000    -1.136169   -.5373638
------------------------------------------------------------------------------

added scalar:
              e(cum_b) =  -.83676652

added scalar:
              e(cum_s) =  .15275918

added scalar:
              e(cum_t) =  -5.477684
.
. esttab using table_4_d.tex , ///
> drop(*) ///
> mgroups("Restricted Finite Distributed Quartic Lag",pattern(1 0 0 0
0 0 0) prefix(\multicolumn{@span}{c}{) suffix(}) span ) ///
> star(* 0.10 ** 0.05 *** 0.01) label ///
> stats(maxlag N cum_b cum_s cum_t imp_b imp_s imp_t, ///
> fmt(%9.0gc %9.0gc %9.2f) ///
> labels("Lags Included" "Observations" "Cumulative Effect" "S.E." "t"
"Impact Effect" "S.E." "t" ) ///
> layout("@" "@" "@" "(@)" "@" "@" "(@)" "@")) ///
> nobase mtitles() nomtitles ///
> compress se(3) b(3) replace nogaps noomitted ///
> nonotes
(file table_4_d.tex not found)
(output written to table_4_d.tex)
.
. log close
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_4d.log
  log type:  text
 closed on:  23 Feb 2023, 12:40:16
------------------------------------------------------------------------------
------------------------------------------------------------
------------------------------------------------------------------------------
------------------------------------------------------------
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
```

```
Revision/Replication/log_table_5.log
  log type:  text
 opened on:  23 Feb 2023, 17:50:29
. * table_5_a
.
. eststo clear
. eststo: reghdfe pm25_pref inv_before_exam `controls0' if percent!=.,
absorb(`absorb1') clust(`cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(   1,      2) =
6.08
Statistics robust to heteroskedasticity           Prob > F        =
0.1325
                                                  R-squared       =
0.3508
                                                  Adj R-squared   =
0.3171
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0702
Number of clusters (slot)    =          3         Root MSE        =
3.2576

     (Std. err. adjusted for 3 clusters in stud_id slot)
------------------------------------------------------------------
                 |               Robust
      pm25_pref | Coefficient  std. err.      t    P>|t|
----------------+-------------------------------------------------
inv_before_exam |      2.105      0.854    2.466   0.133
------------------------------------------------------------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           3           0    *|
         dow |         7           0           7     |
        strm |        24           1          23     |
-----------------------------------------------------+
* = FE nested within cluster; treated as redundant for DoF computation
(est1 stored)
. eststo: reghdfe pm25_pref inv_before_exam `controls1' if percent!=.,
absorb(`absorb1') clust(`cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
Warning: VCV matrix was non-positive semi-definite; adjustment from
```

```
Cameron, Gelbach & Miller applied.
warning: missing F statistic; dropped variables due to collinearity or
too few clusters

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(   7,      2)
=          .
Statistics robust to heteroskedasticity           Prob > F
=          .
                                                  R-squared       =
0.5071
                                                  Adj R-squared   =
0.4816
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.2941
Number of clusters (slot)    =          3         Root MSE        =
2.8384

           (Std. err. adjusted for 3 clusters in stud_id slot)
------------------------------------------------------------------
                       |               Robust
            pm25_pref | Coefficient  std. err.      t    P>|t|
----------------------+-------------------------------------------
      inv_before_exam |      1.682      0.593    2.834   0.105
       temp_daily_avg |      0.290      0.014   20.397   0.002
     precip_daily_avg |     -0.058      0.197   -0.292   0.798
     relhum_daily_avg |      0.110      0.008   13.854   0.005
      press_daily_avg |      1.625      0.071   22.742   0.002
winddir_cos_daily_avg |      0.031      0.004    8.606   0.013
winddir_sin_daily_avg |     -0.077      0.020   -3.878   0.061
------------------------------------------------------------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           3           0    *|
         dow |         7           0           7     |
        strm |        24           1          23     |
-----------------------------------------------------+
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)
. eststo: reghdfe pm25_pref inv_before_exam `controls2' if percent!=.,
absorb(`absorb1') clust(`cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
Warning: VCV matrix was non-positive semi-definite; adjustment from
Cameron, Gelbach & Miller applied.
```

```
warning: missing F statistic; dropped variables due to collinearity or
too few clusters
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,      2)
=          .
Statistics robust to heteroskedasticity           Prob > F
=          .
                                                  R-squared       =
0.5639
                                                  Adj R-squared   =
0.5413
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.3754
Number of clusters (slot)    =          3         Root MSE        =
2.6701
```

```
                                (Std. err. adjusted for 3 clusters in
stud_id slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                  pm25_pref | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-------------------------------------
                           inv_before_exam |      1.235      0.454
2.720   0.113
                            temp_daily_avg |      2.647      1.047
2.527   0.127
                          precip_daily_avg |   -142.864     31.885
-4.481   0.046
                                            |
       c.temp_daily_avg#c.precip_daily_avg |      0.043      0.033
1.303   0.322
                                            |
                            temp_daily_avg |      0.000      0.000
0.000   1.000
                          relhum_daily_avg |     -2.970      0.191
-15.556   0.004
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |     -0.010      0.001
-8.372   0.014
                                            |
                            temp_daily_avg |      0.000      0.000
0.000   1.000
                           press_daily_avg |     -0.679      0.185
-3.666   0.067
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.017      0.010
-1.762   0.220
                                            |
                            temp_daily_avg |      0.000      0.000
0.000   1.000
                     winddir_cos_daily_avg |     -2.605      0.609
-4.275   0.051
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.013      0.002
7.903   0.016
                                            |
                            temp_daily_avg |      0.000      0.000
0.000   1.000
                     winddir_sin_daily_avg |     -9.396      0.564
-16.672   0.004
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.002      0.002
-1.322   0.317
```

```
                                          |
                            temp_daily_avg |      0.000      0.000
0.000   1.000
                          precip_daily_avg |      0.000      0.000
0.000   1.000
                            temp_daily_avg |      0.000      0.000
0.000   1.000
                          relhum_daily_avg |      0.000      0.000
0.000   1.000
                            temp_daily_avg |      0.000      0.000
0.000   1.000
                           press_daily_avg |      0.000      0.000
0.000   1.000
                            temp_daily_avg |      0.000      0.000
0.000   1.000
                       winddir_cos_daily_avg |      0.000      0.000
0.000   1.000
                             temp_daily_avg |      0.000      0.000
0.000   1.000
                       winddir_sin_daily_avg |      0.000      0.000
0.000   1.000
                          precip_daily_avg |      0.000      0.000
0.000   1.000
                          relhum_daily_avg |      0.000      0.000
0.000   1.000
                                          |
     c.precip_daily_avg#c.relhum_daily_avg |      0.127      0.041
3.085   0.091
                                          |
                          precip_daily_avg |      0.000      0.000
0.000   1.000
                           press_daily_avg |      0.000      0.000
0.000   1.000
                                          |
      c.precip_daily_avg#c.press_daily_avg |      1.326      0.291
4.553   0.045
                                          |
                          precip_daily_avg |      0.000      0.000
0.000   1.000
                       winddir_cos_daily_avg |      0.000      0.000
0.000   1.000
                                          |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -0.022      0.047
-0.473   0.683
                                          |
                          precip_daily_avg |      0.000      0.000
0.000   1.000
                       winddir_sin_daily_avg |      0.000      0.000
0.000   1.000
                                          |
```

```
c.precip_daily_avg#c.winddir_sin_daily_avg |      0.308      0.053
5.782   0.029
                                           |
                           relhum_daily_avg |      0.000      0.000
0.000   1.000
                            press_daily_avg |      0.000      0.000
0.000   1.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |      0.031      0.002
17.226   0.003
                                           |
                           relhum_daily_avg |      0.000      0.000
0.000   1.000
                      winddir_cos_daily_avg |      0.000      0.000
0.000   1.000
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.003      0.001
4.309   0.050
                                           |
                           relhum_daily_avg |      0.000      0.000
0.000   1.000
                      winddir_sin_daily_avg |      0.000      0.000
0.000   1.000
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |      0.003      0.000
5.592   0.031
                                           |
                            press_daily_avg |      0.000      0.000
0.000   1.000
                      winddir_cos_daily_avg |      0.000      0.000
0.000   1.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      0.024      0.006
4.206   0.052
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |      0.091      0.006
15.999   0.004
------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           3           0    *|
         dow |         7           0           7     |
        strm |        24           1          23     |
-----------------------------------------------------+
* = FE nested within cluster; treated as redundant for DoF computation
```

```
(est3 stored)
.
. esttab using table_5_a.tex, ///
> keep(*inv_before_exam*) ///
> mgroups("First Stage",pattern(1 0 0 0) prefix(\multicolumn{@span}{c}
{) suffix(}) span ) ///
> star(* 0.10 ** 0.05 *** 0.01) label stats(N, fmt(%9.0fc)
labels("Observations")) ///
> nobase mtitles() nomtitles ///
> compress se(3) b(3) replace nogaps noomitted ///
> indicate( ///
> "Weather Controls = temp_daily_avg" ///
> "Weather Interactions = *#c.precip_daily_avg*" ///
> , labels("Y" " ")) ///
> nonotes
(output written to table_5_a.tex)
.
. * table_5_b
.
. eststo clear
. eststo: ivreghdfe percent (pm25_pref = inv_before_exam)
`controls0' , absorb(`absorb1') clust(`cluster') noconstant  noomitted
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)

IV (2SLS) estimation
--------------------

Estimates efficient for homoskedasticity only
Statistics robust to heteroskedasticity and clustering on stud_id and
slot

Number of clusters (stud_id) =   88959               Number of obs =
1806513
Number of clusters (slot) =          3               F(  1,     2) =
130.51
                                                     Prob > F      =
0.0076
Total (centered) SS     =  3.34556e+11               Centered R2   =
-0.0012
Total (uncentered) SS   =  3.34556e+11               Uncentered R2 =
-0.0012
Residual SS             =  3.34973e+11               Root MSE      =
430.6

------------------------------------------------------------------------
--------
             |               Robust
     percent | Coefficient  std. err.      t    P>|t|     [95% conf.
interval]
```

```
-------------
+-------------------------------------------------------------------
   pm25_pref |  -4.950362   .4333237   -11.42   0.008    -6.814803
-3.085921
-------------------------------------------------------------------
--------
Underidentification test (Kleibergen-Paap rk LM statistic):
2.079
                                                      Chi-sq(1) P-val =
0.1493
-------------------------------------------------------------------
--------
Weak identification test (Cragg-Donald Wald F statistic):
1.4e+05
                         (Kleibergen-Paap rk Wald F statistic):
6.082
Stock-Yogo weak ID test critical values: 10% maximal IV size
16.38
                                         15% maximal IV size
8.96
                                         20% maximal IV size
6.66
                                         25% maximal IV size
5.53
Source: Stock-Yogo (2005).  Reproduced by permission.
NB: Critical values are for Cragg-Donald F statistic and i.i.d.
errors.
-------------------------------------------------------------------
--------
Hansen J statistic (overidentification test of all instruments):
0.000
                                                    (equation exactly
identified)
-------------------------------------------------------------------
--------
Instrumented:         pm25_pref
Excluded instruments: inv_before_exam
Partialled-out:       _cons
                      nb: total SS, model F and R2s are after
partialling-out;
                          any small-sample adjustments include
partialled-out
                          variables in regressor count K
-------------------------------------------------------------------
--------

Absorbed degrees of freedom:
-----------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
```

```
     stud_id |     88959       88959           0    *|
        slot |         3           3           0    *|
         dow |         7           0           7     |
        strm |        24           1          23     |
-------------------------------------------------------+
* = FE nested within cluster; treated as redundant for DoF computation
(est1 stored)
.         estadd scalar CraggDonaldF = e(cdf)

added scalar:
       e(CraggDonaldF) =  136401.79
.         estadd scalar KleibergenPaapF = e(rkf)

added scalar:
    e(KleibergenPaapF) =  6.0824251
. eststo: ivreghdfe percent (pm25_pref = inv_before_exam)
`controls1' , absorb(`absorb1') clust(`cluster') noconstant  noomitted
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)

IV (2SLS) estimation
--------------------

Estimates efficient for homoskedasticity only
Statistics robust to heteroskedasticity and clustering on stud_id and
slot

Number of clusters (stud_id) =   88959               Number of obs =
1806513
Number of clusters (slot) =          3               F(  7,     2) =
1511.64
                                                     Prob > F      =
0.0007
Total (centered) SS     =  3.34556e+11               Centered R2   =
-0.0009
Total (uncentered) SS   =  3.34556e+11               Uncentered R2 =
-0.0009
Residual SS             =  3.34862e+11               Root MSE      =
430.5

------------------------------------------------------------------------
----------------
                       |               Robust
               percent | Coefficient  std. err.      t    P>|t|
[95% conf. interval]
-----------------------
+------------------------------------------------------------------
            pm25_pref |  -6.011242    2.07264    -2.90   0.101
-14.92909    2.906607
       temp_daily_avg |   2.352463   .8438427     2.79   0.108
```

```
-1.278299    5.983225
     precip_daily_avg |   19.84708   3.221741     6.16   0.025
5.985047    33.70912
     relhum_daily_avg |    .494097   .2628657     1.88   0.201
-.636923    1.625117
      press_daily_avg |   12.42008    5.53066     2.25   0.154
-11.37643    36.21659
winddir_cos_daily_avg |    1.69819    1.06802     1.59   0.253
-2.897131     6.29351
winddir_sin_daily_avg |  -2.418793    1.31293    -1.84   0.207
-8.067873    3.230288
------------------------------------------------------------------------
-----------------
Underidentification test (Kleibergen-Paap rk LM statistic):
2.363
                                                      Chi-sq(1) P-val =
0.1243
------------------------------------------------------------------------
--------
Weak identification test (Cragg-Donald Wald F statistic):
1.1e+05
                         (Kleibergen-Paap rk Wald F statistic):
8.034
Stock-Yogo weak ID test critical values: 10% maximal IV size
16.38
                                         15% maximal IV size
8.96
                                         20% maximal IV size
6.66
                                         25% maximal IV size
5.53
Source: Stock-Yogo (2005).  Reproduced by permission.
NB: Critical values are for Cragg-Donald F statistic and i.i.d.
errors.
------------------------------------------------------------------------
--------
Hansen J statistic (overidentification test of all instruments):
0.000
                                                    (equation exactly
identified)
------------------------------------------------------------------------
--------
Instrumented:         pm25_pref
Included instruments: temp_daily_avg precip_daily_avg relhum_daily_avg
                      press_daily_avg winddir_cos_daily_avg
                      winddir_sin_daily_avg
Excluded instruments: inv_before_exam
Partialled-out:       _cons
                      nb: total SS, model F and R2s are after
partialling-out;
```

```
                          any small-sample adjustments include
partialled-out
                          variables in regressor count K
------------------------------------------------------------------------------
--------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           3           0    *|
         dow |         7           0           7     |
        strm |        24           1          23     |
-----------------------------------------------------+
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)
.         estadd scalar CraggDonaldF = e(cdf)

added scalar:
       e(CraggDonaldF) =  109343.25
.         estadd scalar KleibergenPaapF = e(rkf)

added scalar:
    e(KleibergenPaapF) =  8.0340978
. eststo: ivreghdfe percent (pm25_pref = inv_before_exam)
`controls2' , absorb(`absorb1') clust(`cluster') noconstant  noomitted
(dropped 1175 singleton observations)
Warning - duplicate variables detected
Duplicates:         temp_daily_avg precip_daily_avg relhum_daily_avg
                    press_daily_avg winddir_cos_daily_avg
winddir_sin_daily_avg
(MWFE estimator converged in 12 iterations)

IV (2SLS) estimation
--------------------

Estimates efficient for homoskedasticity only
Statistics robust to heteroskedasticity and clustering on stud_id and
slot

Number of clusters (stud_id) =   88959               Number of obs =
1806513
Number of clusters (slot) =          3               F( 21,     2) =
11430.06
                                                     Prob > F      =
0.0001
Total (centered) SS     =  3.34556e+11               Centered R2   =
-0.0016
Total (uncentered) SS   =  3.34556e+11               Uncentered R2 =
```

```
-0.0016
Residual SS             =  3.35102e+11                Root MSE      =
430.7

------------------------------------------------------------------------------
-------------------------------------
                                             |               Robust
                                     percent | Coefficient  std. err.
t    P>|t|     [95% conf. interval]
-------------------------------------------
+----------------------------------------------------------------
                                    pm25_pref |   -9.03213   1.458142
-6.19   0.025    -15.30601   -2.758252
                                temp_daily_avg |   82.97195   46.06535
1.80   0.213    -115.2312    281.1751
                              precip_daily_avg |   2880.569   639.7228
4.50   0.046     128.0643    5633.074
                                             |
       c.temp_daily_avg#c.precip_daily_avg |  -5.908974   3.496983
-1.69   0.233    -20.95528     9.13733
                                             |
                              relhum_daily_avg |  -22.17953   15.94899
-1.39   0.299    -90.80251    46.44345
                                             |
       c.temp_daily_avg#c.relhum_daily_avg |  -.0856252   .0258027
-3.32   0.080    -.1966454     .025395
                                             |
                               press_daily_avg |   3.489115   8.225258
0.42   0.713    -31.90131    38.87954
                                             |
        c.temp_daily_avg#c.press_daily_avg |  -.7291749   .4694355
-1.55   0.261    -2.748993    1.290643
                                             |
                           winddir_cos_daily_avg |  -246.2478   226.6373
-1.09   0.391    -1221.389    728.8939
                                             |
  c.temp_daily_avg#c.winddir_cos_daily_avg |   .3530957   .0964444
3.66   0.067    -.0618709    .7680623
                                             |
                           winddir_sin_daily_avg |   185.2165   153.6602
1.21   0.351    -475.9301     846.363
                                             |
  c.temp_daily_avg#c.winddir_sin_daily_avg |  -.4970426   .1939822
-2.56   0.124    -1.331681    .3375956
                                             |
     c.precip_daily_avg#c.relhum_daily_avg |   1.878007   1.589648
1.18   0.359    -4.961695    8.717709
                                             |
      c.precip_daily_avg#c.press_daily_avg |  -30.06732   5.803297
-5.18   0.035    -55.03689   -5.097745
```

```
                                                    |
c.precip_daily_avg#c.winddir_cos_daily_avg |  -1.945894   1.448425
-1.34   0.311    -8.177965    4.286178
                                                    |
c.precip_daily_avg#c.winddir_sin_daily_avg |   10.65448   4.782034
2.23   0.156     -9.92095    31.22991
                                                    |
      c.relhum_daily_avg#c.press_daily_avg |    .231776   .1613372
1.44   0.287    -.4624018    .9259538
                                                    |
c.relhum_daily_avg#c.winddir_cos_daily_avg |   .0174672   .0844088
0.21   0.855    -.3457145    .3806488
                                                    |
c.relhum_daily_avg#c.winddir_sin_daily_avg |  -.1324067   .0833554
-1.59   0.253    -.4910559    .2262424
                                                    |
 c.press_daily_avg#c.winddir_cos_daily_avg |   2.459439   2.183742
1.13   0.377    -6.936444    11.85532
                                                    |
 c.press_daily_avg#c.winddir_sin_daily_avg |  -1.773971   1.485362
-1.19   0.355    -8.164969    4.617026
------------------------------------------------------------------------
--------------------------------------
Underidentification test (Kleibergen-Paap rk LM statistic):
2.376
                                                      Chi-sq(1) P-val =
0.1232
------------------------------------------------------------------------
--------
Weak identification test (Cragg-Donald Wald F statistic):
6.1e+04
                         (Kleibergen-Paap rk Wald F statistic):
7.402
Stock-Yogo weak ID test critical values: 10% maximal IV size
16.38
                                         15% maximal IV size
8.96
                                         20% maximal IV size
6.66
                                         25% maximal IV size
5.53
Source: Stock-Yogo (2005).  Reproduced by permission.
NB: Critical values are for Cragg-Donald F statistic and i.i.d.
errors.
------------------------------------------------------------------------
--------
Warning: estimated covariance matrix of moment conditions not of full
rank.
         overidentification statistic not reported, and standard
errors and
```

```
         model tests should be interpreted with caution.
Possible causes:
         number of clusters insufficient to calculate robust
covariance matrix
         singleton dummy variable (dummy with one 1 and N-1 0s or vice
versa)
partial option may address problem.
------------------------------------------------------------------------
--------
Instrumented:         pm25_pref
Included instruments: temp_daily_avg precip_daily_avg
                      c.temp_daily_avg#c.precip_daily_avg
relhum_daily_avg
                      c.temp_daily_avg#c.relhum_daily_avg
press_daily_avg
                      c.temp_daily_avg#c.press_daily_avg
winddir_cos_daily_avg
                      c.temp_daily_avg#c.winddir_cos_daily_avg
                      winddir_sin_daily_avg
                      c.temp_daily_avg#c.winddir_sin_daily_avg
                      c.precip_daily_avg#c.relhum_daily_avg
                      c.precip_daily_avg#c.press_daily_avg
                      c.precip_daily_avg#c.winddir_cos_daily_avg
                      c.precip_daily_avg#c.winddir_sin_daily_avg
                      c.relhum_daily_avg#c.press_daily_avg
                      c.relhum_daily_avg#c.winddir_cos_daily_avg
                      c.relhum_daily_avg#c.winddir_sin_daily_avg
                      c.press_daily_avg#c.winddir_cos_daily_avg
                      c.press_daily_avg#c.winddir_sin_daily_avg
Excluded instruments: inv_before_exam
Partialled-out:       _cons
                      nb: total SS, model F and R2s are after
partialling-out;
                          any small-sample adjustments include
partialled-out
                          variables in regressor count K
Duplicates:           temp_daily_avg precip_daily_avg relhum_daily_avg
                      press_daily_avg winddir_cos_daily_avg
                      winddir_sin_daily_avg
------------------------------------------------------------------------
--------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           3           0    *|
         dow |         7           0           7     |
        strm |        24           1          23     |
```

```
----------------------------------------------------+
* = FE nested within cluster; treated as redundant for DoF computation
(est3 stored)
.         estadd scalar CraggDonaldF = e(cdf)

added scalar:
       e(CraggDonaldF) =  61151.184
.         estadd scalar KleibergenPaapF = e(rkf)

added scalar:
    e(KleibergenPaapF) =  7.4022611
.
. esttab using table_5_b.tex, ///
> keep(*pm25_pref*) ///
> mgroups("Second Stage",pattern(1 0 0 0) prefix(\multicolumn{@span}
{c}{) suffix(}) span ) ///
> star(* 0.10 ** 0.05 *** 0.01) label stats(N CraggDonaldF
KleibergenPaapF, fmt(%9.0fc) labels("Observations" "CraggDonaldF" "Kle
> ibergenPaapF")) ///
> nobase mtitles() nomtitles ///
> compress se(3) b(3) replace nogaps noomitted ///
> indicate( ///
> "Weather Controls = temp_daily_avg" ///
> "Weather Interactions = *#c.precip_daily_avg*" ///
> , labels("Y" " ")) ///
> nonotes
(output written to table_5_b.tex)
.
. * table_5_c
.
. eststo clear
. eststo: reghdfe percent inv_before_exam `controls0' ,
absorb(`absorb1') clust(`cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(   1,      2) =
6.17
Statistics robust to heteroskedasticity           Prob > F        =
0.1310
                                                  R-squared       =
0.4868
                                                  Adj R-squared   =
0.4603
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0001
Number of clusters (slot)    =          3         Root MSE        =
441.3279
```

```
     (Std. err. adjusted for 3 clusters in stud_id slot)
------------------------------------------------------------
                |               Robust
        percent | Coefficient  std. err.      t    P>|t|
----------------+-------------------------------------------
inv_before_exam |    -10.421      4.195   -2.484   0.131
------------------------------------------------------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           3           0    *|
         dow |         7           0           7     |
        strm |        24           1          23     |
-----------------------------------------------------+
* = FE nested within cluster; treated as redundant for DoF computation
(est1 stored)
. eststo: reghdfe percent inv_before_exam `controls1' ,
absorb(`absorb1') clust(`cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(   7,      2) =
2385.48
Statistics robust to heteroskedasticity           Prob > F        =
0.0004
                                                  R-squared       =
0.4870
                                                  Adj R-squared   =
0.4604
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0004
Number of clusters (slot)    =          3         Root MSE        =
441.2611

           (Std. err. adjusted for 3 clusters in stud_id slot)
------------------------------------------------------------------
                      |               Robust
              percent | Coefficient  std. err.      t    P>|t|
----------------------+-------------------------------------------
      inv_before_exam |    -10.111      5.064   -1.997   0.184
       temp_daily_avg |      0.610      0.328    1.861   0.204
     precip_daily_avg |     20.193      3.964    5.095   0.036
     relhum_daily_avg |     -0.168      0.080   -2.101   0.170
      press_daily_avg |      2.652      2.537    1.046   0.405
```

```
winddir_cos_daily_avg |      1.509      1.122    1.346   0.311
winddir_sin_daily_avg |     -1.954      1.276   -1.531   0.265
------------------------------------------------------------------------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           3           0    *|
         dow |         7           0           7     |
        strm |        24           1          23     |
-----------------------------------------------------+
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)
. eststo: reghdfe percent inv_before_exam `controls2' ,
absorb(`absorb1') clust(`cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
Warning: VCV matrix was non-positive semi-definite; adjustment from
Cameron, Gelbach & Miller applied.
warning: missing F statistic; dropped variables due to collinearity or
too few clusters
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
```

```
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,      2)
=          .
Statistics robust to heteroskedasticity           Prob > F
=          .
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (slot)    =          3         Root MSE        =
441.1010

                                (Std. err. adjusted for 3 clusters in
stud_id slot)
------------------------------------------------------------------------------
-------------
                                             |               Robust
                                     percent | Coefficient  std. err.
t    P>|t|
-----------------------------------------------
+-----------------------------------------
                           inv_before_exam |    -11.152      5.159
-2.162   0.163
                            temp_daily_avg |     59.063     41.341
1.429   0.289
                          precip_daily_avg |   4170.931   1112.479
3.749   0.064
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -6.294      3.701
-1.701   0.231
                                             |
                            temp_daily_avg |      0.000      0.000
0.000   1.000
                          relhum_daily_avg |      4.650     11.806
0.394   0.732
                                             |
       c.temp_daily_avg#c.relhum_daily_avg |      0.002      0.029
0.068   0.952
                                             |
                            temp_daily_avg |      0.000      0.000
0.000   1.000
```

```
                           press_daily_avg |      9.619      7.735
1.243   0.340
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.577      0.421
-1.372   0.304
                                           |
                            temp_daily_avg |      0.000      0.000
0.000   1.000
                       winddir_cos_daily_avg |   -222.716    219.192
-1.016   0.417
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.239      0.068
3.517   0.072
                                           |
                            temp_daily_avg |      0.000      0.000
0.000   1.000
                       winddir_sin_daily_avg |    270.082    162.482
1.662   0.238
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.479      0.189
-2.539   0.126
                                           |
                            temp_daily_avg |      0.000      0.000
0.000   1.000
                          precip_daily_avg |      0.000      0.000
0.000   1.000
                            temp_daily_avg |      0.000      0.000
0.000   1.000
                          relhum_daily_avg |      0.000      0.000
0.000   1.000
                            temp_daily_avg |      0.000      0.000
0.000   1.000
                           press_daily_avg |      0.000      0.000
0.000   1.000
                            temp_daily_avg |      0.000      0.000
0.000   1.000
                       winddir_cos_daily_avg |      0.000      0.000
0.000   1.000
                            temp_daily_avg |      0.000      0.000
0.000   1.000
                       winddir_sin_daily_avg |      0.000      0.000
0.000   1.000
                          precip_daily_avg |      0.000      0.000
0.000   1.000
                          relhum_daily_avg |      0.000      0.000
0.000   1.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.729      1.925
0.378   0.742
                                           |
```

```
                           precip_daily_avg |      0.000      0.000
0.000   1.000
                            press_daily_avg |      0.000      0.000
0.000   1.000
                                            |
      c.precip_daily_avg#c.press_daily_avg |    -42.047      9.979
-4.214   0.052
                                            |
                           precip_daily_avg |      0.000      0.000
0.000   1.000
                       winddir_cos_daily_avg |      0.000      0.000
0.000   1.000
                                            |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.745      1.460
-1.195   0.355
                                            |
                           precip_daily_avg |      0.000      0.000
0.000   1.000
                       winddir_sin_daily_avg |      0.000      0.000
0.000   1.000
                                            |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.873      4.772
1.650   0.241
                                            |
                           relhum_daily_avg |      0.000      0.000
0.000   1.000
                            press_daily_avg |      0.000      0.000
0.000   1.000
                                            |
      c.relhum_daily_avg#c.press_daily_avg |     -0.048      0.119
-0.404   0.726
                                            |
                           relhum_daily_avg |      0.000      0.000
0.000   1.000
                       winddir_cos_daily_avg |      0.000      0.000
0.000   1.000
                                            |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.011      0.079
-0.143   0.899
                                            |
                           relhum_daily_avg |      0.000      0.000
0.000   1.000
                       winddir_sin_daily_avg |      0.000      0.000
0.000   1.000
                                            |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.156      0.088
-1.770   0.219
                                            |
                            press_daily_avg |      0.000      0.000
0.000   1.000
```

```
                    winddir_cos_daily_avg |      0.000      0.000
0.000   1.000
                                          |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.244      2.113
1.062   0.399
                                          |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.597      1.570
-1.654   0.240
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           3           0    *|
         dow |         7           0           7     |
        strm |        24           1          23     |
-----------------------------------------------------+
* = FE nested within cluster; treated as redundant for DoF computation
(est3 stored)
.
. esttab, keep(*inv_before_exam*)

------------------------------------------------------------
                      (1)             (2)             (3)
                  percent         percent         percent
------------------------------------------------------------
inv_before~m       -10.42          -10.11          -11.15
                  (-2.48)         (-2.00)         (-2.16)
------------------------------------------------------------
N                 1806513         1806513         1806513
------------------------------------------------------------
t statistics in parentheses
* p<0.05, ** p<0.01, *** p<0.001
.
. esttab using table_5_c.tex, ///
> keep(*inv_before_exam*) ///
> mgroups("Reduced Form",pattern(1 0 0 0) prefix(\multicolumn{@span}
{c}{) suffix(}) span ) ///
> star(* 0.10 ** 0.05 *** 0.01) label stats(N, fmt(%9.0fc)
labels("Observations")) ///
> nobase mtitles() nomtitles ///
> compress se(3) b(3) replace nogaps noomitted ///
> indicate( ///
> "Weather Controls = temp_daily_avg" ///
> "Weather Interactions = *#c.precip_daily_avg*" ///
> , labels("Y" " ")) ///
> nonotes
```

```
(output written to table_5_c.tex)
.
. log close
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_5.log
  log type:  text
 closed on:  23 Feb 2023, 18:00:20
-------------------------------------------------------------------------------
-------------------------------------------------------------
-------------------------------------------------------------------------------
-------------------------------------------------------------
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_6.log
  log type:  text
 opened on:  23 Feb 2023, 12:45:53
.
. * table_6
.
. eststo clear
. eststo: reghdfe percent pm25_pref
`controls2'  , absorb(`absorb1'
> ) vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
```

```
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,   1025) =
85.45
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1200

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                             |               Robust
                                     percent | Coefficient  std. err.
t    P>|t|
--------------------------------------------
+-----------------------------------------
                                  pm25_pref |     -0.607      0.124
-4.908   0.000
                            temp_daily_avg |     51.080      5.872
8.699   0.000
                          precip_daily_avg |   4188.076    332.424
12.599   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -6.623      0.545
-12.158   0.000
                                             |
                          relhum_daily_avg |      0.648      2.992
0.217   0.829
                                             |
       c.temp_daily_avg#c.relhum_daily_avg |      0.011      0.005
2.278   0.023
                                             |
                           press_daily_avg |      6.509      2.168
```

```
3.002   0.003
                                                |
        c.temp_daily_avg#c.press_daily_avg |     -0.503      0.057
-8.820   0.000
                                                |
                      winddir_cos_daily_avg |   -232.091     21.792
-10.650   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.259      0.023
11.253   0.000
                                                |
                      winddir_sin_daily_avg |    271.679     23.538
11.542   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.337   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.597      0.313
1.909   0.056
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -42.108      3.209
-13.121   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.750      0.441
-3.966   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.337      0.961
7.638   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.008      0.030
-0.285   0.776
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.393   0.694
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.160      0.014
-11.780   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.334      0.211
11.044   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.610      0.229
-11.416   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
```

```
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-------------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est1 stored)
. eststo: reghdfe percent pm25_pref c.pm25_pref#1.female
`controls2'  , absorb(`absorb1') vce(clust `cluster') `
> display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  22,   1025) =
82.09
```

```
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1189

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                           |               Robust
                                   percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------+----------------------------------
                                  pm25_pref |     -0.282      0.169
-1.665   0.096
                                            |
                          female#c.pm25_pref |
                                          1 |     -0.553      0.181
-3.048   0.002
                                            |
                             temp_daily_avg |     51.103      5.872
8.703   0.000
                            precip_daily_avg |   4181.166    332.425
12.578   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.610      0.545
-12.133   0.000
                                            |
                            relhum_daily_avg |      0.646      2.992
0.216   0.829
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.011      0.005
2.271   0.023
                                            |
                             press_daily_avg |      6.509      2.168
3.002   0.003
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.503      0.057
-8.824   0.000
                                            |
                       winddir_cos_daily_avg |   -232.156     21.792
-10.653   0.000
                                            |
```

```
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.259      0.023
11.259   0.000
                                           |
                      winddir_sin_daily_avg |    272.141     23.538
11.562   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.349   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.602      0.313
1.925   0.054
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -42.043      3.209
-13.101   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.749      0.441
-3.963   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.326      0.961
7.627   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.008      0.030
-0.284   0.776
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.005      0.011
-0.397   0.691
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.160      0.014
-11.788   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.334      0.211
11.048   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.614      0.229
-11.436   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)
```

```
. eststo: reghdfe percent pm25_pref c.pm25_pref##1.stem_course
`controls2'  , absorb(`absorb1') vce(clust `cluster') `display_
> options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: pm25_pref omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
609.99
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4919
                                                  Adj R-squared   =
0.4655
Number of clusters (stud_id) =     88,959         Within R-sq.    =
```

```
0.0099
Number of clusters (date_slot) =      1,026       Root MSE        =
439.1640

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
--------------------------------------------
+-----------------------------------
                                 pm25_pref |     -0.560      0.134
-4.177   0.000
                                           |
                              1.stem_course |   -119.446      1.556
-76.774   0.000
                                           |
                    stem_course#c.pm25_pref |
                                          1  |     -0.502      0.192
-2.608   0.009
                                           |
                             temp_daily_avg |     57.963      5.843
9.919   0.000
                            precip_daily_avg |   4189.609    330.705
12.669   0.000
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -4.414      0.541
-8.155   0.000
                                           |
                            relhum_daily_avg |      8.077      2.981
2.709   0.007
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |     -0.001      0.005
-0.199   0.843
                                           |
                             press_daily_avg |     11.051      2.160
5.116   0.000
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.564      0.057
-9.937   0.000
                                           |
                       winddir_cos_daily_avg |   -183.657     21.672
-8.474   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.273      0.023
11.960   0.000
                                           |
                       winddir_sin_daily_avg |    283.379     23.445
```

```
12.087   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.509      0.025
-20.421   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.536      0.311
1.727   0.084
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -42.177      3.193
-13.211   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.310      0.439
-5.264   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.016      0.956
5.248   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.082      0.030
-2.762   0.006
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.028      0.011
-2.469   0.014
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.148      0.014
-10.904   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      1.870      0.210
8.902   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.730      0.228
-11.988   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est3 stored)
. eststo: reghdfe percent pm25_pref c.pm25_pref##1.stem_course
`controls2'  if stem_student==1, absorb(`absorb1') vce(clust `c
> luster') `display_options'
(dropped 227 singleton observations)
```

```
(MWFE estimator converged in 12 iterations)
note: pm25_pref omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
769,007
Absorbing 4 HDFE groups                           F(  23,   1024) =
388.40
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.5159
                                                  Adj R-squared   =
0.4938
Number of clusters (stud_id) =     33,433         Within R-sq.    =
0.0125
Number of clusters (date_slot) =      1,025       Root MSE        =
446.1931
```

```
                       (Std. err. adjusted for 1,025 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-------------------------------------
                                  pm25_pref |     -0.423      0.264
-1.604   0.109
                                            |
                              1.stem_course |    -93.241      1.931
-48.285   0.000
                                            |
                   stem_course#c.pm25_pref |
                                         1  |     -1.646      0.277
-5.935   0.000
                                            |
                            temp_daily_avg |     52.339      9.243
5.663   0.000
                          precip_daily_avg |   4657.612    508.671
9.156   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -2.859      0.834
-3.427   0.001
                                            |
                          relhum_daily_avg |     14.205      4.619
3.076   0.002
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |     -0.050      0.008
-6.705   0.000
                                            |
                           press_daily_avg |     19.032      3.364
5.657   0.000
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.475      0.090
-5.277   0.000
                                            |
                     winddir_cos_daily_avg |   -474.568     33.010
-14.377   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.187      0.037
5.086   0.000
                                            |
                     winddir_sin_daily_avg |    587.716     37.490
15.677   0.000
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.730      0.039
-18.570   0.000
```

```
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.309      0.472
0.655   0.512
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -46.847      4.918
-9.526   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -5.969      0.641
-9.319   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      9.494      1.468
6.468   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.136      0.046
-2.969   0.003
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.103      0.017
5.963   0.000
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.294      0.021
-13.894   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      4.670      0.320
14.592   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -5.668      0.364
-15.559   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     33433       33433           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est4 stored)
. eststo: reghdfe percent pm25_pref c.pm25_pref##1.stem_course
`controls2'  if stem_student==0, absorb(`absorb1') vce(clust `c
> luster') `display_options'
(dropped 948 singleton observations)
(MWFE estimator converged in 12 iterations)
note: pm25_pref omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,037,506
Absorbing 4 HDFE groups                           F(  23,   1025) =
238.15
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4678
                                                  Adj R-squared   =
0.4376
Number of clusters (stud_id) =     55,526         Within R-sq.    =
0.0097
Number of clusters (date_slot) =      1,026       Root MSE        =
432.7293

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
```

```
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
--------------------------------------------
+-----------------------------------
                                  pm25_pref |     -0.067      0.160
-0.415   0.678
                                            |
                               1.stem_course |   -163.210      4.918
-33.186   0.000
                                            |
                    stem_course#c.pm25_pref |
                                          1 |     -5.109      0.763
-6.699   0.000
                                            |
                              temp_daily_avg |     51.751      7.534
6.868   0.000
                             precip_daily_avg |   3825.541    434.469
8.805   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -5.386      0.714
-7.544   0.000
                                            |
                             relhum_daily_avg |      7.265      3.912
1.857   0.063
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.039      0.006
6.163   0.000
                                            |
                              press_daily_avg |      8.166      2.822
2.894   0.004
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.531      0.073
-7.272   0.000
                                            |
                        winddir_cos_daily_avg |     55.671     28.772
1.935   0.053
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.337      0.029
11.526   0.000
                                            |
                        winddir_sin_daily_avg |     99.500     30.012
3.315   0.001
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.373      0.032
-11.553   0.000
                                            |
     c.precip_daily_avg#c.relhum_daily_avg |      0.326      0.408
0.798   0.425
                                            |
```

```
      c.precip_daily_avg#c.press_daily_avg |    -38.288      4.191
-9.136   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |      1.402      0.604
2.322   0.020
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      2.084      1.262
1.652   0.099
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.078      0.039
-2.002   0.045
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.127      0.015
-8.370   0.000
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.066      0.018
-3.736   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |     -0.439      0.279
-1.572   0.116
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -0.947      0.291
-3.251   0.001
-------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     55526       55526           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est5 stored)
.
. esttab using table_6.tex, ///
> keep(*pm25*) ///
> star(* 0.10 ** 0.05 *** 0.01) label stats(N, fmt(%9.0fc)
labels("Observations")) ///
> nobase mtitles("All" "All" "All" "STEM" "Non-STEM") ///
> compress se(3) b(3) replace nogaps noomitted ///
> indicate( ///
> "Weather Controls = temp_daily_avg" ///
> "Weather Interactions = *#c.precip_daily_avg*" ///
> , labels("Y" " ")) ///
> nonotes
```

```
(file table_6.tex not found)
(output written to table_6.tex)
.
. log close
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_6.log
  log type:  text
 closed on:  23 Feb 2023, 12:54:16
-------------------------------------------------------------------------
-------------------------------------------------------------
-------------------------------------------------------------------------
-------------------------------------------------------------
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_7.log
  log type:  text
 opened on:  23 Feb 2023, 12:54:16
. * table_7
.
. eststo clear
. eststo: reghdfe percent pm25_pref pm25_semester
`controls2' , absorb(`absorb1') vce(clust `cluster') `display_o
> ptions'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
```

```
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  22,   1025) =
82.48
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1177

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                             |               Robust
                                     percent | Coefficient  std. err.
t    P>|t|
--------------------------------------------
+-----------------------------------------
                                   pm25_pref |     -0.623      0.124
-5.035   0.000
                              pm25_semester |     -9.311      2.143
-4.345   0.000
                             temp_daily_avg |     47.494      5.925
8.016   0.000
                           precip_daily_avg |   4188.709    332.431
12.600   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -6.659      0.545
-12.223   0.000
                                             |
                           relhum_daily_avg |      1.347      2.998
0.449   0.653
                                             |
       c.temp_daily_avg#c.relhum_daily_avg |      0.010      0.005
2.047   0.041
```

```
                                                |
                             press_daily_avg |      6.919      2.171
3.187   0.001
                                                |
        c.temp_daily_avg#c.press_daily_avg |     -0.467      0.058
-8.111   0.000
                                                |
                       winddir_cos_daily_avg |   -216.884     22.114
-9.807   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.249      0.023
10.745   0.000
                                                |
                       winddir_sin_daily_avg |    269.645     23.546
11.452   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.493      0.025
-19.626   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.592      0.313
1.894   0.058
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -42.101      3.209
-13.119   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.800      0.442
-4.076   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.498      0.961
7.801   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.015      0.030
-0.515   0.606
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.012      0.012
-1.054   0.292
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.166      0.014
-12.172   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.188      0.214
10.207   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.585      0.229
-11.301   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
```

```
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est1 stored)
. eststo: reghdfe percent pm25_pref pm25_semester_med
`controls2' , absorb(`absorb1') vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  22,   1025) =
```

```
82.52
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1177

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------
                                 pm25_pref |     -0.574      0.124
-4.637   0.000
                     pm25_semester_median |    -11.416      2.607
-4.379   0.000
                           temp_daily_avg |     50.701      5.873
8.633   0.000
                        precip_daily_avg |   4165.322    332.505
12.527   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.712      0.545
-12.316   0.000
                                            |
                        relhum_daily_avg |      2.320      3.019
0.769   0.442
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.008      0.005
1.637   0.102
                                            |
                         press_daily_avg |      7.604      2.184
3.482   0.000
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.498      0.057
-8.722   0.000
                                            |
                    winddir_cos_daily_avg |   -218.202     22.071
-9.886   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.251      0.023
10.878   0.000
```

```
                                                |
                     winddir_sin_daily_avg |    271.360     23.538
11.529   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.489      0.025
-19.503   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.572      0.313
1.828   0.068
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -41.849      3.210
-13.037   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.759      0.441
-3.985   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.503      0.961
7.806   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.025      0.030
-0.832   0.405
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.009      0.011
-0.816   0.414
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.167      0.014
-12.221   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.199      0.214
10.273   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.601      0.229
-11.377   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)
. eststo: reghdfe percent pm25_pref pm25_days_above_10
`controls2' , absorb(`absorb1') vce(clust `cluster') `display_options'
```

```
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  22,   1025) =
84.36
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1121
```

```
                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-------------------------------------
                                  pm25_pref |     -0.659      0.124
-5.316   0.000
                        pm25_days_above_10 |     -2.329      0.295
-7.895   0.000
                            temp_daily_avg |     46.699      5.893
7.925   0.000
                          precip_daily_avg |   4129.568    332.591
12.416   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.644      0.545
-12.196   0.000
                                            |
                          relhum_daily_avg |      2.614      3.007
0.869   0.385
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.009      0.005
1.839   0.066
                                            |
                           press_daily_avg |      7.592      2.175
3.491   0.000
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.459      0.057
-8.011   0.000
                                            |
                     winddir_cos_daily_avg |   -206.561     22.067
-9.361   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.241      0.023
10.414   0.000
                                            |
                     winddir_sin_daily_avg |    269.539     23.542
11.449   0.000
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.496      0.025
-19.800   0.000
                                            |
     c.precip_daily_avg#c.relhum_daily_avg |      0.538      0.313
1.719   0.086
                                            |
      c.precip_daily_avg#c.press_daily_avg |    -41.463      3.211
-12.912   0.000
```

```
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.878      0.442
-4.250   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.819      0.963
7.081   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.028      0.030
-0.934   0.350
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.017      0.012
-1.453   0.146
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.169      0.014
-12.383   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.088      0.214
9.762   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.581      0.229
-11.286   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est3 stored)
. eststo: reghdfe percent pm25_pref pm25_days_above_12
`controls2' , absorb(`absorb1') vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  22,   1025) =
82.22
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1184

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
             |                    Robust
             |    percent | Coefficient  std. err.
t    P>|t|
-------------+----------------------------------------
+----------------------------------------
             |
             |
             |
```

```
-3.676   0.000
                             temp_daily_avg |     52.438      5.880
8.919   0.000
                           precip_daily_avg |   4152.444    332.490
12.489   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.564      0.545
-12.043   0.000
                                            |
                           relhum_daily_avg |     -0.888      3.024
-0.294   0.769
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.013      0.005
2.593   0.010
                                            |
                            press_daily_avg |      5.495      2.187
2.512   0.012
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.517      0.057
-9.056   0.000
                                            |
                      winddir_cos_daily_avg |   -246.301     22.149
-11.120   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.267      0.023
11.548   0.000
                                            |
                      winddir_sin_daily_avg |    271.211     23.537
11.523   0.000
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.482      0.025
-19.250   0.000
                                            |
     c.precip_daily_avg#c.relhum_daily_avg |      0.653      0.313
2.084   0.037
                                            |
      c.precip_daily_avg#c.press_daily_avg |    -41.803      3.209
-13.025   0.000
                                            |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.675      0.442
-3.788   0.000
                                            |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.290      0.961
7.589   0.000
                                            |
      c.relhum_daily_avg#c.press_daily_avg |      0.007      0.030
0.225   0.822
                                            |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.003      0.012
0.268   0.788
```

```
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.156      0.014
-11.416   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.470      0.215
11.504   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.609      0.229
-11.411   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est4 stored)
.
. esttab using table_7.tex, ///
> keep(*pm25*) ///
> star(* 0.10 ** 0.05 *** 0.01) label stats(N, fmt(%9.0fc)
labels("Observations")) ///
> nobase mtitles() nomtitles ///
> compress se(3) b(3) replace nogaps noomitted ///
> indicate( ///
> "Weather Controls = temp_daily_avg" ///
> "Weather Interactions = *#c.precip_daily_avg*" ///
> , labels("Y" " ")) ///
> nonotes
(file table_7.tex not found)
(output written to table_7.tex)
.
. log close
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_7.log
  log type:  text
 closed on:  23 Feb 2023, 13:02:47
------------------------------------------------------------------------------
-------------------------------------------------------------
------------------------------------------------------------------------------
-------------------------------------------------------------
      name:  <unnamed>
```

```
      log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_8.log
  log type:  text
 opened on:  23 Feb 2023, 15:34:59
. * table_8
.
. eststo clear
. eststo: reghdfe percent c.pm25_pref `controls2'  , absorb(`absorb3')
vce(clust `cluster') `display_options'
(dropped 92 singleton observations)
(MWFE estimator converged in 9 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,807,596
Absorbing 4 HDFE groups                           F(  21,   3452) =
23.40
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
```

```
                                                  R-squared       =
0.0994
                                                  Adj R-squared   =
0.0976
                                                  Within R-sq.    =
0.0003
Number of clusters (crse_id) =      3,453         Root MSE        =
571.3171

                                (Std. err. adjusted for 3,453
clusters in crse_id)
------------------------------------------------------------------------
-------------
                                           |               Robust
                                   percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                 pm25_pref |     -1.191      0.170
-7.008   0.000
                           temp_daily_avg |     25.569      8.055
3.174   0.002
                          precip_daily_avg |   1038.881    457.125
2.273   0.023
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -1.179      0.743
-1.586   0.113
                                           |
                          relhum_daily_avg |     -8.530      4.117
-2.072   0.038
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.008      0.007
1.205   0.228
                                           |
                           press_daily_avg |     -3.809      2.974
-1.281   0.200
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.256      0.078
-3.273   0.001
                                           |
                     winddir_cos_daily_avg |   -209.012     29.865
-6.999   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.335      0.031
10.695   0.000
                                           |
                     winddir_sin_daily_avg |    166.071     32.320
5.138   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.193      0.035
```

```
-5.586   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.731      0.430
1.699   0.089
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -10.678      4.413
-2.420   0.016
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |      3.189      0.590
5.409   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.219      1.323
5.457   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |      0.081      0.041
1.980   0.048
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.037      0.016
2.338   0.019
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.076      0.019
-4.072   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.060      0.290
7.115   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -1.591      0.314
-5.067   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     crse_id |      3453        3453           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est1 stored)
. eststo: reghdfe percent c.pm25_pref##1.upperfloor  `controls2'  ,
absorb(`absorb3') vce(clust `cluster') `display_options'
(dropped 92 singleton observations)
(MWFE estimator converged in 9 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,807,596
Absorbing 4 HDFE groups                           F(  23,   3452) =
23.99
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.0994
                                                  Adj R-squared   =
0.0977
                                                  Within R-sq.    =
0.0003
Number of clusters (crse_id) =      3,453         Root MSE        =
571.3082

                                 (Std. err. adjusted for 3,453
clusters in crse_id)
------------------------------------------------------------------------
-------------
                                             |               Robust
```

```
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                  pm25_pref |     -2.161      0.316
-6.834   0.000
                               1.upperfloor |      2.372      2.232
1.063   0.288
                                            |
                     upperfloor#c.pm25_pref |
                                          1 |      1.164      0.317
3.674   0.000
                                            |
                              temp_daily_avg |     25.363      8.054
3.149   0.002
                            precip_daily_avg |   1000.232    457.152
2.188   0.029
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -1.217      0.743
-1.638   0.101
                                            |
                            relhum_daily_avg |     -8.506      4.117
-2.066   0.039
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.008      0.007
1.210   0.226
                                            |
                             press_daily_avg |     -3.807      2.973
-1.280   0.200
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.254      0.078
-3.248   0.001
                                            |
                         winddir_cos_daily_avg |   -209.430     29.870
-7.011   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.334      0.031
10.680   0.000
                                            |
                         winddir_sin_daily_avg |    164.875     32.322
5.101   0.000
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.194      0.035
-5.610   0.000
                                            |
     c.precip_daily_avg#c.relhum_daily_avg |      0.723      0.430
1.683   0.092
                                            |
      c.precip_daily_avg#c.press_daily_avg |    -10.279      4.413
-2.329   0.020
```

```
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |      3.223      0.590
5.467   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.302      1.323
5.520   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |      0.081      0.041
1.973   0.048
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.037      0.016
2.344   0.019
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.075      0.019
-4.041   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.064      0.290
7.127   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -1.579      0.314
-5.030   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     crse_id |      3453        3453           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)
. eststo: reghdfe percent c.pm25_pref##1.upperfloor `controls2'  if
newbuilding==0, absorb(`absorb3') vce(clust `cluster') `displ
> ay_options'
(dropped 29 singleton observations)
(MWFE estimator converged in 11 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
```

```
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
413,197
Absorbing 4 HDFE groups                           F(  23,   2003) =
9.76
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.1038
                                                  Adj R-squared   =
0.0993
                                                  Within R-sq.    =
0.0006
Number of clusters (crse_id) =      2,004         Root MSE        =
546.6723

                                  (Std. err. adjusted for 2,004
clusters in crse_id)
------------------------------------------------------------------------------
             |               Robust
     percent | Coefficient  std. err.      t    P>|t|
-------------+----------------------------------------------------------------
    pm25_pref |     -3.248      0.509    -6.376   0.000
```

```
                              1.upperfloor |      0.313      3.881
0.081   0.936
                                           |
                    upperfloor#c.pm25_pref |
                                         1 |      2.283      0.546
4.184   0.000
                                           |
                              temp_daily_avg |    -22.758     18.569
-1.226   0.220
                             precip_daily_avg |   3171.411    933.282
3.398   0.001
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -0.285      1.573
-0.181   0.856
                                           |
                             relhum_daily_avg |     -8.879      9.638
-0.921   0.357
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.018      0.016
1.177   0.239
                                           |
                              press_daily_avg |     -6.220      7.003
-0.888   0.374
                                           |
        c.temp_daily_avg#c.press_daily_avg |      0.212      0.181
1.176   0.239
                                           |
                        winddir_cos_daily_avg |     93.125     68.310
1.363   0.173
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.359      0.069
5.192   0.000
                                           |
                        winddir_sin_daily_avg |    134.264     77.848
1.725   0.085
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.150      0.079
-1.897   0.058
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |     -0.372      0.860
-0.432   0.666
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -31.066      9.005
-3.450   0.001
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |      1.320      1.195
1.105   0.269
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |     12.916      2.853
4.528   0.000
```

```
                                                |
      c.relhum_daily_avg#c.press_daily_avg |      0.088      0.096
0.923   0.356
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.047      0.036
-1.279   0.201
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |      0.006      0.044
0.147   0.883
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |     -0.887      0.662
-1.340   0.180
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -1.343      0.757
-1.774   0.076
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     crse_id |      2004        2004           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est3 stored)
. eststo: reghdfe percent c.pm25_pref##1.upperfloor `controls2'  if
newbuilding==1, absorb(`absorb3') vce(clust `cluster') `displ
> ay_options'
(dropped 87 singleton observations)
(MWFE estimator converged in 9 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
```

```
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,372,129
Absorbing 4 HDFE groups                           F(  23,   3297) =
18.33
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.1031
                                                  Adj R-squared   =
0.1009
                                                  Within R-sq.    =
0.0003
Number of clusters (crse_id) =      3,298         Root MSE        =
578.8842

                                 (Std. err. adjusted for 3,298
clusters in crse_id)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                   percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                 pm25_pref |     -0.995      0.475
-2.095   0.036
                              1.upperfloor |      4.533      3.375
1.343   0.179
                                            |
                    upperfloor#c.pm25_pref |
                                         1  |      0.065      0.474
0.137   0.891
```

```
                                                 |
                              temp_daily_avg |     29.174      9.396
3.105   0.002
                            precip_daily_avg |    245.361    566.778
0.433   0.665
                                                 |
       c.temp_daily_avg#c.precip_daily_avg |     -2.161      0.912
-2.371   0.018
                                                 |
                            relhum_daily_avg |     -4.083      4.781
-0.854   0.393
                                                 |
       c.temp_daily_avg#c.relhum_daily_avg |      0.005      0.008
0.649   0.516
                                                 |
                             press_daily_avg |     -0.197      3.440
-0.057   0.954
                                                 |
        c.temp_daily_avg#c.press_daily_avg |     -0.289      0.091
-3.168   0.002
                                                 |
                      winddir_cos_daily_avg |   -229.182     34.883
-6.570   0.000
                                                 |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.335      0.037
9.143   0.000
                                                 |
                      winddir_sin_daily_avg |    236.012     37.184
6.347   0.000
                                                 |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.215      0.040
-5.331   0.000
                                                 |
     c.precip_daily_avg#c.relhum_daily_avg |      0.566      0.550
1.028   0.304
                                                 |
      c.precip_daily_avg#c.press_daily_avg |     -2.623      5.468
-0.480   0.631
                                                 |
c.precip_daily_avg#c.winddir_cos_daily_avg |      3.500      0.731
4.786   0.000
                                                 |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.836      1.602
3.642   0.000
                                                 |
      c.relhum_daily_avg#c.press_daily_avg |      0.036      0.047
0.750   0.454
                                                 |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.044      0.018
2.407   0.016
```

```
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.114      0.022
-5.250   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.257      0.338
6.670   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.258      0.361
-6.253   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     crse_id |      3298        3298           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est4 stored)
. eststo: reghdfe percent c.pm25_pref##1.newbuilding `controls2'  ,
absorb(`absorb3') vce(clust `cluster') `display_options'
(dropped 92 singleton observations)
(MWFE estimator converged in 9 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
```

```
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,785,350
Absorbing 4 HDFE groups                           F(  23,   3413) =
21.78
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.0987
                                                  Adj R-squared   =
0.0969
                                                  Within R-sq.    =
0.0003
Number of clusters (crse_id) =      3,414         Root MSE        =
572.8946

                                 (Std. err. adjusted for 3,414
clusters in crse_id)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                  pm25_pref |     -1.584      0.264
-5.989   0.000
                             1.newbuilding |     -2.693      1.888
-1.427   0.154
                                            |
                    newbuilding#c.pm25_pref |
                                         1  |      0.446      0.269
1.661   0.097
                                            |
                            temp_daily_avg |     28.140      8.135
3.459   0.001
                          precip_daily_avg |    828.447    461.009
1.797   0.072
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -1.308      0.752
```

```
-1.739   0.082
                                                |
                           relhum_daily_avg |     -8.184      4.161
-1.967   0.049
                                                |
       c.temp_daily_avg#c.relhum_daily_avg |      0.008      0.007
1.230   0.219
                                                |
                            press_daily_avg |     -3.772      3.002
-1.256   0.209
                                                |
        c.temp_daily_avg#c.press_daily_avg |     -0.281      0.079
-3.564   0.000
                                                |
                      winddir_cos_daily_avg |   -196.559     30.084
-6.534   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.341      0.031
10.816   0.000
                                                |
                      winddir_sin_daily_avg |    165.318     32.547
5.079   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.195      0.035
-5.588   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.729      0.436
1.672   0.095
                                                |
      c.precip_daily_avg#c.press_daily_avg |     -8.558      4.449
-1.924   0.054
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |      3.070      0.595
5.159   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.206      1.338
5.387   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |      0.077      0.041
1.872   0.061
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.035      0.016
2.192   0.028
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.070      0.019
-3.741   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      1.938      0.292
6.644   0.000
                                                |
```

```
 c.press_daily_avg#c.winddir_sin_daily_avg |     -1.588      0.316
-5.022   0.000
-------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     crse_id |      3414        3414           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est5 stored)
. eststo: reghdfe percent c.pm25_pref##1.newbuilding
c.pm25_pref##1.leed `controls2'  , absorb(`absorb3') vce(clust
`cluster') `d
> isplay_options'
(dropped 92 singleton observations)
(MWFE estimator converged in 9 iterations)
note: pm25_pref omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
```

```
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,785,350
Absorbing 4 HDFE groups                           F(  25,   3413) =
20.08
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.0987
                                                  Adj R-squared   =
0.0969
                                                  Within R-sq.    =
0.0003
Number of clusters (crse_id) =      3,414         Root MSE        =
572.8947

                                  (Std. err. adjusted for 3,414
clusters in crse_id)
------------------------------------------------------------------------------
-------------
                                             |               Robust
                                     percent | Coefficient  std. err.
t    P>|t|
-----------------------------------------------
+-----------------------------------------
                                   pm25_pref |     -1.711      0.299
-5.715   0.000
                               1.newbuilding |     -3.225      2.067
-1.560   0.119
                                             |
                     newbuilding#c.pm25_pref |
                                           1 |      0.575      0.303
1.896   0.058
                                             |
                                     1.leed |     -2.039      3.982
-0.512   0.609
                                             |
                             leed#c.pm25_pref |
                                           1 |      0.452      0.531
0.850   0.395
                                             |
                               temp_daily_avg |     28.103      8.136
3.454   0.001
                              precip_daily_avg |    847.188    461.313
```

```
1.836   0.066
                                                 |
       c.temp_daily_avg#c.precip_daily_avg |     -1.307      0.752
-1.738   0.082
                                                 |
                           relhum_daily_avg |     -8.206      4.162
-1.972   0.049
                                                 |
       c.temp_daily_avg#c.relhum_daily_avg |      0.008      0.007
1.229   0.219
                                                 |
                            press_daily_avg |     -3.778      3.003
-1.258   0.208
                                                 |
        c.temp_daily_avg#c.press_daily_avg |     -0.281      0.079
-3.559   0.000
                                                 |
                       winddir_cos_daily_avg |   -196.783     30.082
-6.541   0.000
                                                 |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.341      0.031
10.818   0.000
                                                 |
                       winddir_sin_daily_avg |    165.622     32.551
5.088   0.000
                                                 |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.195      0.035
-5.608   0.000
                                                 |
     c.precip_daily_avg#c.relhum_daily_avg |      0.723      0.436
1.656   0.098
                                                 |
      c.precip_daily_avg#c.press_daily_avg |     -8.741      4.452
-1.963   0.050
                                                 |
c.precip_daily_avg#c.winddir_cos_daily_avg |      3.066      0.595
5.151   0.000
                                                 |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.213      1.338
5.392   0.000
                                                 |
      c.relhum_daily_avg#c.press_daily_avg |      0.078      0.041
1.877   0.061
                                                 |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.035      0.016
2.199   0.028
                                                 |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.071      0.019
-3.752   0.000
                                                 |
```

```
 c.press_daily_avg#c.winddir_cos_daily_avg |      1.940      0.292
6.652   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -1.590      0.316
-5.030   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     crse_id |      3414        3414           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est6 stored)
. eststo: reghdfe percent c.pm25_pref##1.newbuilding
c.pm25_pref##1.leed_gold `controls2'  , absorb(`absorb3') vce(clust
`cluster
> ') `display_options'
(dropped 92 singleton observations)
(MWFE estimator converged in 9 iterations)
note: pm25_pref omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
```

```
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,785,350
Absorbing 4 HDFE groups                           F(  25,   3413) =
20.25
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.0987
                                                  Adj R-squared   =
0.0969
                                                  Within R-sq.    =
0.0003
Number of clusters (crse_id) =      3,414         Root MSE        =
572.8941

                                (Std. err. adjusted for 3,414
clusters in crse_id)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                 pm25_pref |     -1.894      0.299
-6.345   0.000
                             1.newbuilding |     -4.400      2.064
-2.132   0.033
                                            |
                   newbuilding#c.pm25_pref |
                                         1  |      0.755      0.302
2.498   0.012
                                            |
                               1.leed_gold |     -7.277      3.990
-1.824   0.068
                                            |
                     leed_gold#c.pm25_pref |
                                         1  |      1.179      0.531
2.220   0.026
                                            |
```

```
                            temp_daily_avg |     28.158      8.136
3.461   0.001
                           precip_daily_avg |    874.129    461.370
1.895   0.058
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -1.310      0.752
-1.741   0.082
                                            |
                           relhum_daily_avg |     -8.265      4.162
-1.986   0.047
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.008      0.007
1.222   0.222
                                            |
                            press_daily_avg |     -3.801      3.003
-1.266   0.206
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.281      0.079
-3.565   0.000
                                            |
                        winddir_cos_daily_avg |   -197.151     30.083
-6.554   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.341      0.031
10.819   0.000
                                            |
                        winddir_sin_daily_avg |    166.080     32.551
5.102   0.000
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.196      0.035
-5.633   0.000
                                            |
     c.precip_daily_avg#c.relhum_daily_avg |      0.713      0.436
1.635   0.102
                                            |
      c.precip_daily_avg#c.press_daily_avg |     -9.004      4.452
-2.022   0.043
                                            |
c.precip_daily_avg#c.winddir_cos_daily_avg |      3.052      0.595
5.126   0.000
                                            |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.221      1.338
5.398   0.000
                                            |
      c.relhum_daily_avg#c.press_daily_avg |      0.078      0.041
1.892   0.059
                                            |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.035      0.016
2.207   0.027
                                            |
```

```
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.071      0.019
-3.768   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      1.944      0.292
6.664   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -1.595      0.316
-5.044   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     crse_id |      3414        3414           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est7 stored)
.
. esttab using table_8.tex, ///
> keep(*pm25*) ///
> star(* 0.10 ** 0.05 *** 0.01) label stats(N, fmt(%9.0fc)
labels("Observations")) ///
> mtitle("\shortstack{Pref.\\Spec.}" "\shortstack{All \\ Bldg.}"
"\shortstack{Old \\ Bldg.}" "\shortstack{New \\ Bldg.}" "\shorts
> tack{All \\ Bldg.}" "\shortstack{Leed \\ Bldg.}" "\shortstack{Leed
Gold \\ Bldg.}") ///
> compress se(3) b(3) replace nogaps noomitted ///
> indicate( ///
> "Weather Controls = temp_daily_avg" ///
> "Weather Interactions = *#c.precip_daily_avg*" ///
> , labels("Y" " ")) ///
> nonotes
(output written to table_8.tex)
.
. log close
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_8.log
  log type:  text
 closed on:  23 Feb 2023, 15:46:58
------------------------------------------------------------------------------
-------------------------------------------------------------
------------------------------------------------------------------------------
-------------------------------------------------------------
```

```
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_9.log
  log type:  text
 opened on:  23 Feb 2023, 13:13:04
. * table_9
.
. eststo clear
.
. capture drop pm25_custom
. gen pm25_custom = pm25_pref
. label var pm25_custom "PM2.5"
.
. eststo: reghdfe percent pm25_custom `controls2'  , absorb(`absorb1')
vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
```

```
HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,   1025) =
85.45
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1200

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                             |               Robust
                                     percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                 pm25_custom |     -0.607      0.124
-4.908   0.000
                              temp_daily_avg |     51.080      5.872
8.699   0.000
                            precip_daily_avg |   4188.076    332.424
12.599   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -6.623      0.545
-12.158   0.000
                                             |
                            relhum_daily_avg |      0.648      2.992
0.217   0.829
                                             |
       c.temp_daily_avg#c.relhum_daily_avg |      0.011      0.005
2.278   0.023
                                             |
                             press_daily_avg |      6.509      2.168
3.002   0.003
                                             |
        c.temp_daily_avg#c.press_daily_avg |     -0.503      0.057
-8.820   0.000
                                             |
                      winddir_cos_daily_avg |   -232.091     21.792
-10.650   0.000
                                             |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.259      0.023
```

```
11.253   0.000
                                                |
                      winddir_sin_daily_avg |    271.679     23.538
11.542   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.337   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.597      0.313
1.909   0.056
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -42.108      3.209
-13.121   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.750      0.441
-3.966   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.337      0.961
7.638   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.008      0.030
-0.285   0.776
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.393   0.694
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.160      0.014
-11.780   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.334      0.211
11.044   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.610      0.229
-11.416   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est1 stored)
.
```

```
. capture drop pm25_custom
. gen pm25_custom = pm25_pref
. replace pm25_custom = pm25_9 if hour==9
(685,686 real changes made)
. replace pm25_custom = pm25_14 if hour==14
(612,938 real changes made)
. replace pm25_custom = pm25_19 if hour==19
(495,269 real changes made)
. label var pm25_custom "PM2.5"
.
. eststo: reghdfe percent pm25_custom `controls2'  , absorb(`absorb1')
vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,   1025) =
```

```
86.65
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1167

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                             |               Robust
                                     percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-------------------------------------
                                pm25_custom |     -0.634      0.090
-7.058   0.000
                            temp_daily_avg |     51.341      5.862
8.759   0.000
                          precip_daily_avg |   4155.511    332.353
12.503   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -6.628      0.545
-12.173   0.000
                                             |
                          relhum_daily_avg |     -0.459      3.000
-0.153   0.878
                                             |
       c.temp_daily_avg#c.relhum_daily_avg |      0.012      0.005
2.568   0.010
                                             |
                           press_daily_avg |      5.819      2.173
2.678   0.007
                                             |
        c.temp_daily_avg#c.press_daily_avg |     -0.506      0.057
-8.883   0.000
                                             |
                     winddir_cos_daily_avg |   -235.332     21.805
-10.792   0.000
                                             |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.254      0.023
11.078   0.000
                                             |
                     winddir_sin_daily_avg |    269.921     23.537
```

```
11.468   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.354   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.615      0.312
1.967   0.049
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -41.789      3.209
-13.024   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.711      0.441
-3.876   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.427      0.960
7.734   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |      0.003      0.030
0.088   0.930
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.003      0.011
-0.280   0.780
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.160      0.014
-11.809   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.365      0.211
11.186   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.592      0.229
-11.338   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)
.
. capture drop pm25_custom
. gen pm25_custom = pm25_pref
. replace pm25_custom = (pm25_7+pm25_8+pm25_9) /3 if hour==9
```

```
(685,221 real changes made)
. replace pm25_custom = (pm25_12+pm25_13+pm25_14) /3 if hour==14
(614,967 real changes made)
. replace pm25_custom = (pm25_17+pm25_18+pm25_19) /3 if hour==19
(498,912 real changes made)
. label var pm25_custom "PM2.5"
.
. eststo: reghdfe percent pm25_custom `controls2'  , absorb(`absorb1')
vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,   1025) =
86.43
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
```

```
                                                R-squared       =
0.4873
                                                Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959       Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026     Root MSE        =
441.1171

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                          |               Robust
                                  percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                              pm25_custom |     -0.632      0.093
-6.814   0.000
                           temp_daily_avg |     51.044      5.861
8.710   0.000
                         precip_daily_avg |   4191.591    332.205
12.617   0.000
                                          |
       c.temp_daily_avg#c.precip_daily_avg |     -6.650      0.545
-12.211   0.000
                                          |
                         relhum_daily_avg |     -0.477      3.001
-0.159   0.874
                                          |
       c.temp_daily_avg#c.relhum_daily_avg |      0.012      0.005
2.644   0.008
                                          |
                          press_daily_avg |      5.773      2.173
2.657   0.008
                                          |
        c.temp_daily_avg#c.press_daily_avg |     -0.503      0.057
-8.835   0.000
                                          |
                     winddir_cos_daily_avg |   -236.382     21.813
-10.837   0.000
                                          |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.257      0.023
11.181   0.000
                                          |
                     winddir_sin_daily_avg |    268.020     23.557
11.378   0.000
                                          |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.483      0.025
```

```
-19.309   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.585      0.312
1.873   0.061
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -42.128      3.207
-13.135   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.748      0.441
-3.961   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.364      0.960
7.671   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |      0.003      0.030
0.094   0.925
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.002      0.011
-0.209   0.835
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.160      0.014
-11.754   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.375      0.211
11.228   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.574      0.229
-11.247   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est3 stored)
.
. capture drop pm25_custom
. gen pm25_custom = pm25_pref
. replace pm25_custom = (pm25_9+pm25_10+pm25_11) /3 if hour==9
(684,305 real changes made)
. replace pm25_custom = (pm25_14+pm25_15+pm25_16) /3 if hour==14
(616,757 real changes made)
```

```
. replace pm25_custom = (pm25_19+pm25_20+pm25_21) /3 if hour==19
(496,959 real changes made)
. label var pm25_custom "PM2.5"
.
. eststo: reghdfe percent pm25_custom `controls2'  , absorb(`absorb1')
vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,   1025) =
84.76
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
```

```
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0010
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1220

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                               pm25_custom |     -0.269      0.093
-2.898   0.004
                            temp_daily_avg |     49.650      5.860
8.472   0.000
                          precip_daily_avg |   4213.488    332.632
12.667   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.659      0.545
-12.227   0.000
                                            |
                          relhum_daily_avg |      1.276      2.995
0.426   0.670
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.015      0.005
3.276   0.001
                                            |
                           press_daily_avg |      6.413      2.171
2.954   0.003
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.493      0.057
-8.651   0.000
                                            |
                     winddir_cos_daily_avg |   -231.689     21.792
-10.632   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.252      0.023
11.002   0.000
                                            |
                     winddir_sin_daily_avg |    274.538     23.538
11.664   0.000
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.325   0.000
                                            |
     c.precip_daily_avg#c.relhum_daily_avg |      0.551      0.313
```

```
1.763   0.078
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -42.321      3.211
-13.179   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.721      0.442
-3.897   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.259      0.961
7.554   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.015      0.030
-0.513   0.608
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.005      0.011
-0.474   0.636
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.161      0.014
-11.870   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.330      0.211
11.028   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.637      0.229
-11.535   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est4 stored)
.
. capture drop pm25_custom
. gen pm25_custom = pm25_pref
. replace pm25_custom =
(pm25_1+pm25_2+pm25_3+pm25_4+pm25_5+pm25_6+pm25_7) /7
(1,835,802 real changes made)
. label var pm25_custom "PM2.5"
.
. eststo: reghdfe percent pm25_custom `controls2' , absorb(`absorb1')
vce(clust `cluster') `display_options'
```

```
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,   1025) =
92.09
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1015
```

```
                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                               pm25_custom |     -1.169      0.090
-13.050   0.000
                            temp_daily_avg |     54.915      5.873
9.350   0.000
                          precip_daily_avg |   4273.137    332.136
12.866   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.529      0.545
-11.984   0.000
                                            |
                          relhum_daily_avg |     -1.283      2.982
-0.430   0.667
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.004      0.005
0.887   0.375
                                            |
                           press_daily_avg |      6.216      2.168
2.868   0.004
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.534      0.057
-9.352   0.000
                                            |
                     winddir_cos_daily_avg |   -256.698     21.915
-11.713   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.294      0.023
12.658   0.000
                                            |
                     winddir_sin_daily_avg |    270.784     23.501
11.522   0.000
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.480      0.025
-19.162   0.000
                                            |
     c.precip_daily_avg#c.relhum_daily_avg |      0.793      0.313
2.532   0.011
                                            |
      c.precip_daily_avg#c.press_daily_avg |    -43.142      3.207
-13.453   0.000
                                            |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.887      0.441
```

```
-4.274   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.856      0.959
7.150   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |      0.012      0.030
0.402   0.688
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.008      0.011
0.724   0.469
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.158      0.014
-11.667   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.569      0.212
12.093   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.602      0.228
-11.400   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est5 stored)
.
. capture drop pm25_custom
. gen pm25_custom = pm25_pref
. replace pm25_custom = alt_pm25_9 if hour==9
(684,162 real changes made, 96,145 to missing)
. replace pm25_custom = alt_pm25_14 if hour==14
(612,721 real changes made, 88,172 to missing)
. replace pm25_custom = alt_pm25_19 if hour==19
(498,912 real changes made, 76,004 to missing)
. label var pm25_custom "PM2.5"
.
. eststo: reghdfe percent pm25_custom `controls2'  if year>=2013,
absorb(`absorb1') vce(clust `cluster') `display_options'
(dropped 2922 singleton observations)
(MWFE estimator converged in 10 iterations)
note: temp_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
851,374
Absorbing 4 HDFE groups                           F(  21,    395) =
81.75
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.5071
                                                  Adj R-squared   =
0.4696
Number of clusters (stud_id) =     60,114         Within R-sq.    =
0.0022
Number of clusters (date_slot) =        396       Root MSE        =
431.1201

                          (Std. err. adjusted for 396 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
```

```
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------
                                pm25_custom |     -0.649      0.120
-5.404   0.000
                            temp_daily_avg |     64.106      7.958
8.056   0.000
                           precip_daily_avg |   2648.629    606.207
4.369   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -2.277      0.713
-3.193   0.001
                                            |
                           relhum_daily_avg |     26.788      5.671
4.723   0.000
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |     -0.008      0.007
-1.191   0.234
                                            |
                            press_daily_avg |     18.127      3.806
4.763   0.000
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.626      0.077
-8.079   0.000
                                            |
                       winddir_cos_daily_avg |   -495.559     36.026
-13.756   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.264      0.035
7.638   0.000
                                            |
                       winddir_sin_daily_avg |    334.338     44.328
7.542   0.000
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.310      0.041
-7.555   0.000
                                            |
     c.precip_daily_avg#c.relhum_daily_avg |      0.648      0.540
1.199   0.231
                                            |
      c.precip_daily_avg#c.press_daily_avg |    -27.299      5.834
-4.679   0.000
                                            |
c.precip_daily_avg#c.winddir_cos_daily_avg |      0.268      1.082
0.248   0.804
                                            |
c.precip_daily_avg#c.winddir_sin_daily_avg |      8.367      1.597
```

```
5.239   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.268      0.056
-4.771   0.000
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.038      0.018
-2.115   0.034
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.133      0.022
-5.942   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      5.010      0.351
14.294   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -3.267      0.433
-7.542   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     60114       60114           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        10           1           9    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est6 stored)
.
. capture drop pm25_custom
. gen pm25_custom = pm25_pref
. label var pm25_custom "PM2.5"
.
. eststo: reghdfe percent pm25_custom `controls2'  if year>=2013,
absorb(`absorb1') vce(clust `cluster') `display_options'
(dropped 1827 singleton observations)
(MWFE estimator converged in 10 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,112,790
Absorbing 4 HDFE groups                           F(  21,    524) =
85.03
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4951
                                                  Adj R-squared   =
0.4614
Number of clusters (stud_id) =     69,553         Within R-sq.    =
0.0017
Number of clusters (date_slot) =        525       Root MSE        =
435.7153

                         (Std. err. adjusted for 525 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                               pm25_custom |     -0.970      0.150
-6.480   0.000
                            temp_daily_avg |     82.530      7.581
```

```
10.886   0.000
                          precip_daily_avg |   3498.157    369.554
9.466   0.000
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -6.884      0.608
-11.326   0.000
                                           |
                          relhum_daily_avg |     -3.291      4.741
-0.694   0.488
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |     -0.012      0.007
-1.883   0.060
                                           |
                           press_daily_avg |      1.329      3.279
0.405   0.685
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.801      0.074
-10.848   0.000
                                           |
                      winddir_cos_daily_avg |   -230.301     30.098
-7.652   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.342      0.033
10.455   0.000
                                           |
                      winddir_sin_daily_avg |    371.027     39.391
9.419   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.324      0.038
-8.602   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      1.246      0.353
3.525   0.000
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -35.802      3.574
-10.016   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.665      0.524
-5.084   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      2.489      1.249
1.992   0.046
                                           |
      c.relhum_daily_avg#c.press_daily_avg |      0.030      0.047
0.640   0.522
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.065      0.016
-3.949   0.000
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.087      0.020
```

```
-4.330   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.378      0.291
8.160   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -3.651      0.384
-9.501   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     69553       69553           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        13           1          12    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est7 stored)
.
. esttab using table_9.tex, ///
> keep(*pm25*) ///
> star(* 0.10 ** 0.05 *** 0.01) label stats(N, fmt(%9.0fc)
labels("Observations")) ///
> mtitle("\shortstack{Pref}" "\shortstack{T}" "\shortstack{(T-3,T)}"
"\shortstack{(T,T+3)}" "\shortstack{1h-7h}" "\shortstack{Alt
> . Mtr.}" "\shortstack{2013 On}") ///
> compress se(3) b(3) replace nogaps noomitted ///
> indicate( ///
> "Weather Controls = temp_daily_avg" ///
> "Weather Interactions = *#c.precip_daily_avg*" ///
> , labels("Y" " ")) ///
> nonotes
(file table_9.tex not found)
(output written to table_9.tex)
.
. log close
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_9.log
  log type:  text
 closed on:  23 Feb 2023, 13:25:28
------------------------------------------------------------------------------
-------------------------------------------------------------
------------------------------------------------------------------------------
-------------------------------------------------------------
      name:  <unnamed>
```

```
      log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_10.log
  log type:  text
 opened on:  23 Feb 2023, 13:25:28
. * table_10
.
. eststo clear
. eststo: reghdfe percent pm25_pref
`controls2' , absorb(`absorb1') vce(clust `cluster') `display_o
> ptions'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,   1025) =
85.45
Statistics robust to heteroskedasticity           Prob > F        =
```

```
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,957         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1200

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                  pm25_pref |     -0.607      0.124
-4.908   0.000
                            temp_daily_avg |     51.080      5.872
8.699   0.000
                          precip_daily_avg |   4188.076    332.424
12.599   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.623      0.545
-12.158   0.000
                                            |
                          relhum_daily_avg |      0.648      2.992
0.217   0.829
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.011      0.005
2.278   0.023
                                            |
                           press_daily_avg |      6.509      2.168
3.002   0.003
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.503      0.057
-8.820   0.000
                                            |
                     winddir_cos_daily_avg |   -232.091     21.792
-10.650   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.259      0.023
11.253   0.000
                                            |
                     winddir_sin_daily_avg |    271.679     23.538
11.542   0.000
                                            |
```

```
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.337   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.597      0.313
1.909   0.056
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -42.108      3.209
-13.121   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.750      0.441
-3.966   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.337      0.961
7.638   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.008      0.030
-0.285   0.776
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.393   0.694
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.160      0.014
-11.780   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.334      0.211
11.044   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.610      0.229
-11.416   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est1 stored)
. eststo: reghdfe percent pm25_pref co_daily_avg  `controls2' ,
absorb(`absorb1') vce(clust `cluster') `display_options'
(dropped 1174 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,801,973
Absorbing 4 HDFE groups                           F(  22,   1025) =
83.54
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4877
                                                  Adj R-squared   =
0.4611
Number of clusters (stud_id) =     88,957         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,023       Root MSE        =
440.8209

                      (Std. err. adjusted for 1,023 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
```

```
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
--------------------------------------------
+-----------------------------------
                                  pm25_pref |      0.135      0.163
0.827   0.408
                               co_daily_avg |    -66.517     10.733
-6.197   0.000
                              temp_daily_avg |     57.077      5.925
9.633   0.000
                            precip_daily_avg |   4227.299    332.433
12.716   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -7.130      0.550
-12.958   0.000
                                            |
                            relhum_daily_avg |      2.433      2.994
0.813   0.416
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.008      0.005
1.629   0.103
                                            |
                             press_daily_avg |      8.256      2.172
3.801   0.000
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.560      0.058
-9.738   0.000
                                            |
                        winddir_cos_daily_avg |   -251.790     21.857
-11.520   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.265      0.023
11.510   0.000
                                            |
                        winddir_sin_daily_avg |    277.613     23.624
11.751   0.000
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.495      0.025
-19.684   0.000
                                            |
     c.precip_daily_avg#c.relhum_daily_avg |      0.475      0.313
1.519   0.129
                                            |
      c.precip_daily_avg#c.press_daily_avg |    -42.388      3.209
-13.209   0.000
                                            |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.717      0.444
-3.869   0.000
                                            |
```

```
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.564      0.963
7.857   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.025      0.030
-0.848   0.396
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.009      0.011
0.756   0.450
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.159      0.014
-11.707   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.521      0.212
11.896   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.669      0.229
-11.631   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88957       88957           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)
. eststo: reghdfe percent pm25_pref no2_daily_avg `controls2' ,
absorb(`absorb1') vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
```

```
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  22,   1025) =
81.75
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1195

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                           |               Robust
                                   percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                 pm25_pref |     -0.826      0.157
-5.252   0.000
                            no2_daily_avg |      0.291      0.131
2.215   0.027
                           temp_daily_avg |     48.884      5.946
8.222   0.000
                         precip_daily_avg |   4201.986    332.489
```

```
12.638   0.000
                                                 |
       c.temp_daily_avg#c.precip_daily_avg |     -6.694      0.545
-12.273   0.000
                                                 |
                           relhum_daily_avg |     -0.365      3.024
-0.121   0.904
                                                 |
       c.temp_daily_avg#c.relhum_daily_avg |      0.015      0.005
2.921   0.003
                                                 |
                            press_daily_avg |      5.536      2.210
2.504   0.012
                                                 |
        c.temp_daily_avg#c.press_daily_avg |     -0.484      0.058
-8.402   0.000
                                                 |
                       winddir_cos_daily_avg |   -232.659     21.795
-10.675   0.000
                                                 |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.260      0.023
11.304   0.000
                                                 |
                       winddir_sin_daily_avg |    273.812     23.550
11.627   0.000
                                                 |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.485      0.025
-19.363   0.000
                                                 |
     c.precip_daily_avg#c.relhum_daily_avg |      0.581      0.313
1.857   0.063
                                                 |
      c.precip_daily_avg#c.press_daily_avg |    -42.227      3.210
-13.156   0.000
                                                 |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.792      0.442
-4.055   0.000
                                                 |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.357      0.960
7.660   0.000
                                                 |
      c.relhum_daily_avg#c.press_daily_avg |      0.001      0.030
0.044   0.965
                                                 |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.005      0.011
-0.482   0.630
                                                 |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.162      0.014
-11.921   0.000
                                                 |
```

```
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.340      0.211
11.072   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.630      0.229
-11.497   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est3 stored)
. eststo: reghdfe percent pm25_pref o3_daily_avg  `controls2' ,
absorb(`absorb1') vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
```

```
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  22,   1025) =
84.19
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1131

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-----------------------------------------------
+-----------------------------------------
                                  pm25_pref |     -0.272      0.131
-2.076   0.038
                              o3_daily_avg |      0.611      0.082
7.424   0.000
                            temp_daily_avg |     49.498      5.878
8.420   0.000
                           precip_daily_avg |   4077.948    332.648
12.259   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.605      0.545
-12.126   0.000
                                            |
                           relhum_daily_avg |      1.036      2.991
0.346   0.729
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.008      0.005
1.724   0.085
                                            |
                            press_daily_avg |      7.185      2.169
```

```
3.313   0.001
                                                |
        c.temp_daily_avg#c.press_daily_avg |     -0.486      0.057
-8.510   0.000
                                                |
                      winddir_cos_daily_avg |   -229.881     21.794
-10.548   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.250      0.023
10.882   0.000
                                                |
                      winddir_sin_daily_avg |    262.814     23.558
11.156   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.495      0.025
-19.743   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.684      0.313
2.186   0.029
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -41.110      3.211
-12.804   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.890      0.441
-4.282   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.318      0.960
7.619   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.011      0.030
-0.355   0.722
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.372   0.710
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.156      0.014
-11.506   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.312      0.211
10.942   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.523      0.229
-11.028   0.000
------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
```

```
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-------------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est4 stored)
. eststo: reghdfe percent pm25_pref so2_daily_avg `controls2' ,
absorb(`absorb1') vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  22,   1025) =
85.16
Statistics robust to heteroskedasticity           Prob > F        =
```

```
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1091

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+----------------------------------------
                                  pm25_pref |     -0.285      0.129
-2.214   0.027
                             so2_daily_avg |     -9.691      1.064
-9.108   0.000
                            temp_daily_avg |     55.515      5.888
9.428   0.000
                          precip_daily_avg |   4224.508    332.432
12.708   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.817      0.545
-12.503   0.000
                                            |
                          relhum_daily_avg |      0.618      2.992
0.207   0.836
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.011      0.005
2.300   0.021
                                            |
                           press_daily_avg |      6.710      2.168
3.094   0.002
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.546      0.057
-9.549   0.000
                                            |
                     winddir_cos_daily_avg |   -232.045     21.791
-10.649   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.267      0.023
11.592   0.000
                                            |
                     winddir_sin_daily_avg |    288.238     23.627
```

```
12.200   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.486      0.025
-19.432   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.551      0.313
1.762   0.078
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -42.419      3.209
-13.218   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.453      0.443
-3.282   0.001
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.029      0.961
7.315   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.009      0.030
-0.295   0.768
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.003      0.011
-0.298   0.766
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.161      0.014
-11.849   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.330      0.211
11.029   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.773      0.230
-12.084   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est5 stored)
. eststo: reghdfe percent pm25_pref co_daily_avg no2_daily_avg
o3_daily_avg so2_daily_avg  `controls2' , absorb(`absorb1') vce(cl
> ust `cluster') `display_options'
(dropped 1174 singleton observations)
```

```
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,801,973
Absorbing 4 HDFE groups                           F(  25,   1022) =
82.43
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4878
                                                  Adj R-squared   =
0.4612
Number of clusters (stud_id) =     88,957         Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,023       Root MSE        =
440.7913

                      (Std. err. adjusted for 1,023 clusters in
```

```
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-------------------------------------
                                  pm25_pref |     -0.171      0.171
-0.998   0.318
                               co_daily_avg |    -87.758     13.512
-6.495   0.000
                              no2_daily_avg |      1.886      0.172
10.936   0.000
                               o3_daily_avg |      1.002      0.098
10.195   0.000
                              so2_daily_avg |    -10.522      1.091
-9.648   0.000
                             temp_daily_avg |     46.860      6.031
7.770   0.000
                            precip_daily_avg |   4179.500    332.766
12.560   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -7.909      0.557
-14.189   0.000
                                            |
                            relhum_daily_avg |     -3.393      3.047
-1.114   0.265
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.029      0.005
5.525   0.000
                                            |
                             press_daily_avg |      3.572      2.222
1.607   0.108
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.472      0.058
-8.076   0.000
                                            |
                      winddir_cos_daily_avg |   -254.647     21.910
-11.623   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.268      0.023
11.640   0.000
                                            |
                      winddir_sin_daily_avg |    298.491     23.830
12.526   0.000
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.524      0.025
-20.754   0.000
                                            |
```

```
     c.precip_daily_avg#c.relhum_daily_avg |      0.451      0.313
1.440   0.150
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -41.876      3.211
-13.040   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.819      0.445
-4.083   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.452      0.965
7.726   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |      0.033      0.030
1.102   0.271
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.005      0.011
0.464   0.643
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.171      0.014
-12.456   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.549      0.212
12.000   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.866      0.231
-12.387   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88957       88957           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est6 stored)
.
. esttab using table_10.tex, ///
> keep(*pm25*) ///
> star(* 0.10 ** 0.05 *** 0.01) label stats(N, fmt(%9.0fc)
labels("Observations")) ///
> mtitle("\shortstack{Pref.\\Spec.}" "\shortstack{Incl.\\ CO}"
"\shortstack{Incl.\\ NO2}" "\shortstack{Incl.\\ O3}" "\shortstack{
> Incl.\\ SO2}" "\shortstack{Incl.\\ Multi}") ///
> compress se(3) b(3) replace nogaps noomitted ///
```

```
> indicate( ///
> "CO = *co_daily_avg*" ///
> "NO2 = *no2_daily_avg*" ///
> "O3 = *o3_daily_avg*" ///
> "SO2 = *so2_daily_avg*" ///
> "Weather Controls = temp_daily_avg" ///
> "Weather Interactions = *#c.precip_daily_avg*" ///
> , labels("Y" " ")) ///
> nonotes
(file table_10.tex not found)
(output written to table_10.tex)
.
. log close
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_10.log
  log type:  text
 closed on:  23 Feb 2023, 13:38:20
-------------------------------------------------------------------------
-------------------------------------------------------------
-------------------------------------------------------------------------
-------------------------------------------------------------
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_11.log
  log type:  text
 opened on:  23 Feb 2023, 13:38:20
. * table_11
. *ssc install winsor
.
. eststo clear
.
. capture drop pm25_winsor
. gen pm25_winsor = pm25_pref
. label var pm25_winsor "PM2.5"
.
. eststo: reghdfe percent pm25_winsor  `controls2' , absorb(`absorb1')
vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,   1025) =
85.45
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1200

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                           |               Robust
                                   percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                              pm25_winsor |     -0.607      0.124
-4.908   0.000
                           temp_daily_avg |     51.080      5.872
```

```
8.699   0.000
                          precip_daily_avg |   4188.076    332.424
12.599   0.000
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -6.623      0.545
-12.158   0.000
                                           |
                          relhum_daily_avg |      0.648      2.992
0.217   0.829
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.011      0.005
2.278   0.023
                                           |
                           press_daily_avg |      6.509      2.168
3.002   0.003
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.503      0.057
-8.820   0.000
                                           |
                      winddir_cos_daily_avg |   -232.091     21.792
-10.650   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.259      0.023
11.253   0.000
                                           |
                      winddir_sin_daily_avg |    271.679     23.538
11.542   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.337   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.597      0.313
1.909   0.056
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -42.108      3.209
-13.121   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.750      0.441
-3.966   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.337      0.961
7.638   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.008      0.030
-0.285   0.776
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.393   0.694
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.160      0.014
```

```
-11.780   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.334      0.211
11.044   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.610      0.229
-11.416   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est1 stored)
.
. capture drop pm25_winsor
. winsor pm25_pref, gen(pm25_winsor) p(0.10) highonly
. label var pm25_winsor "PM2.5"
.
. eststo: reghdfe percent pm25_winsor  `controls2' , absorb(`absorb1')
vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
```

```
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,   1025) =
85.02
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0010
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1213

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
----------------------------------------------
+-----------------------------------------
                                pm25_winsor |     -0.608      0.163
-3.737   0.000
                              temp_daily_avg |     51.101      5.886
8.681   0.000
                            precip_daily_avg |   4276.308    332.152
12.875   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.630      0.545
-12.170   0.000
                                            |
                            relhum_daily_avg |      1.001      2.992
0.335   0.738
```

```
                                                 |
       c.temp_daily_avg#c.relhum_daily_avg |      0.013      0.005
2.581   0.010
                                                 |
                            press_daily_avg |      6.644      2.168
3.065   0.002
                                                 |
        c.temp_daily_avg#c.press_daily_avg |     -0.504      0.057
-8.830   0.000
                                                 |
                        winddir_cos_daily_avg |   -230.967     21.788
-10.601   0.000
                                                 |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.255      0.023
11.120   0.000
                                                 |
                        winddir_sin_daily_avg |    273.833     23.525
11.640   0.000
                                                 |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.340   0.000
                                                 |
     c.precip_daily_avg#c.relhum_daily_avg |      0.545      0.312
1.743   0.081
                                                 |
      c.precip_daily_avg#c.press_daily_avg |    -42.955      3.207
-13.394   0.000
                                                 |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.771      0.442
-4.010   0.000
                                                 |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.357      0.962
7.647   0.000
                                                 |
      c.relhum_daily_avg#c.press_daily_avg |     -0.012      0.030
-0.409   0.682
                                                 |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.005      0.011
-0.464   0.642
                                                 |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.161      0.014
-11.852   0.000
                                                 |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.323      0.211
10.997   0.000
                                                 |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.631      0.229
-11.513   0.000
-------------------------------------------------------------------------
-------------
```

```
Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)
.
. capture drop pm25_winsor
. winsor pm25_pref, gen(pm25_winsor) p(0.10) lowonly
. label var pm25_winsor "PM2.5"
.
. eststo: reghdfe percent pm25_winsor  `controls2' , absorb(`absorb1')
vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
```

```
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,   1025) =
85.32
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1204

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                               pm25_winsor |     -0.580      0.126
-4.612   0.000
                            temp_daily_avg |     50.927      5.871
8.674   0.000
                          precip_daily_avg |   4186.214    332.490
12.591   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.626      0.545
-12.163   0.000
                                            |
                          relhum_daily_avg |      0.931      2.988
0.312   0.755
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.011      0.005
2.363   0.018
                                            |
                           press_daily_avg |      6.626      2.168
3.057   0.002
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.502      0.057
-8.801   0.000
```

```
                                                |
                     winddir_cos_daily_avg |   -232.789     21.797
-10.680   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.259      0.023
11.258   0.000
                                                |
                     winddir_sin_daily_avg |    271.604     23.545
11.536   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.483      0.025
-19.298   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.587      0.313
1.877   0.061
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -42.082      3.210
-13.111   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.753      0.441
-3.972   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.301      0.960
7.603   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.011      0.030
-0.382   0.703
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.367   0.713
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.160      0.014
-11.743   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.340      0.211
11.074   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.609      0.229
-11.410   0.000
------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
```

```
-------------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est3 stored)
.
. capture drop pm25_winsor
. winsor pm25_pref, gen(pm25_winsor) p(0.10)
. label var pm25_winsor "PM2.5"
.
. eststo: reghdfe percent pm25_winsor  `controls2' , absorb(`absorb1')
vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,   1025) =
84.89
```

```
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0010
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1217

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------+----------------------------------
                                pm25_winsor |     -0.560      0.167
-3.346   0.001
                              temp_daily_avg |     50.871      5.886
8.642   0.000
                             precip_daily_avg |   4270.869    332.136
12.859   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.634      0.545
-12.177   0.000
                                            |
                             relhum_daily_avg |      1.305      2.987
0.437   0.662
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.013      0.005
2.687   0.007
                                            |
                              press_daily_avg |      6.754      2.167
3.116   0.002
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.503      0.057
-8.799   0.000
                                            |
                        winddir_cos_daily_avg |   -231.694     21.791
-10.632   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.255      0.023
11.126   0.000
                                            |
                        winddir_sin_daily_avg |    273.810     23.534
11.634   0.000
```

```
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.483      0.025
-19.300   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.536      0.312
1.715   0.086
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -42.893      3.207
-13.376   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.771      0.442
-4.012   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.312      0.962
7.604   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.015      0.030
-0.514   0.607
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.005      0.011
-0.438   0.661
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.161      0.014
-11.817   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.330      0.211
11.028   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.631      0.229
-11.508   0.000
------------------------------------------------------------------------------
------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est4 stored)
.
. esttab using table_11.tex, ///
> keep(*pm25*) ///
> star(* 0.10 ** 0.05 *** 0.01) label stats(N, fmt(%9.0fc)
labels("Observations")) ///
```

```
> mtitle("\shortstack{Pref.\\Spec.}" "\shortstack{Wins.\\ High}"
"\shortstack{Wins.\\ Low}" "\shortstack{Wins.\\ Both}" ) ///
> nobase ///
> compress se(3) b(3) replace nogaps noomitted ///
> indicate( ///
> "Weather Controls = temp_daily_avg" ///
> "Weather Interactions = *#c.precip_daily_avg*" ///
> , labels("Y" " ")) ///
> nonotes
(file table_11.tex not found)
(output written to table_11.tex)
.
. log close
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_11.log
  log type:  text
 closed on:  23 Feb 2023, 13:46:42
-------------------------------------------------------------------------------
-------------------------------------------------------------
-------------------------------------------------------------------------------
-------------------------------------------------------------
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_12.log
  log type:  text
 opened on:  23 Feb 2023, 13:46:42
. * table_12
.
. eststo clear
.
. eststo: reghdfe percent pm25_pref  `controls2' , absorb(`absorb1')
vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
```

```
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,   1025) =
85.45
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1201

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                  pm25_pref |     -0.607      0.124
-4.908   0.000
                            temp_daily_avg |     51.080      5.872
8.699   0.000
                          precip_daily_avg |   4188.076    332.424
12.599   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.623      0.545
```

```
-12.158   0.000
                                                |
                            relhum_daily_avg |      0.648      2.992
0.217   0.829
                                                |
       c.temp_daily_avg#c.relhum_daily_avg |      0.011      0.005
2.278   0.023
                                                |
                             press_daily_avg |      6.509      2.168
3.002   0.003
                                                |
        c.temp_daily_avg#c.press_daily_avg |     -0.503      0.057
-8.820   0.000
                                                |
                        winddir_cos_daily_avg |   -232.091     21.792
-10.650   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.259      0.023
11.253   0.000
                                                |
                        winddir_sin_daily_avg |    271.679     23.538
11.542   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.337   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.597      0.313
1.909   0.056
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -42.108      3.209
-13.121   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.750      0.441
-3.966   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.337      0.961
7.638   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.008      0.030
-0.285   0.776
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.393   0.694
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.160      0.014
-11.780   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.334      0.211
11.044   0.000
                                                |
```

```
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.610      0.229
-11.416   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est1 stored)
. eststo: reghdfe percent pm25_pref  `controls2' , absorb(`absorb1')
vce(clust stud_id) `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
```

```
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,  88958) =
85.96
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
                                                  Within R-sq.    =
0.0011
Number of clusters (stud_id) =     88,959         Root MSE        =
441.1201

                                 (Std. err. adjusted for 88,959
clusters in stud_id)
------------------------------------------------------------------------------
             |                    Robust
             |      percent | Coefficient  std. err.
t    P>|t|
-------------+----------------------------------------
+----------------------------------------
             |
             |
             |
```

```
                    winddir_cos_daily_avg |   -232.091     21.373
-10.859   0.000
                                          |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.259      0.023
11.429   0.000
                                          |
                    winddir_sin_daily_avg |    271.679     22.979
11.823   0.000
                                          |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.620   0.000
                                          |
     c.precip_daily_avg#c.relhum_daily_avg |      0.597      0.311
1.921   0.055
                                          |
      c.precip_daily_avg#c.press_daily_avg |    -42.108      3.201
-13.155   0.000
                                          |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.750      0.438
-3.999   0.000
                                          |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.337      0.949
7.731   0.000
                                          |
      c.relhum_daily_avg#c.press_daily_avg |     -0.008      0.029
-0.290   0.772
                                          |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.404   0.686
                                          |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.160      0.013
-12.053   0.000
                                          |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.334      0.207
11.258   0.000
                                          |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.610      0.223
-11.693   0.000
------------------------------------------------------------------------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
```

```
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)
. eststo: reghdfe percent pm25_pref  `controls2' , absorb(`absorb1')
vce(clust `cluster2') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  21,    344) =
85.96
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4873
                                                  Adj R-squared   =
0.4608
```

```
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date)    =        345         Root MSE        =
441.1201

                              (Std. err. adjusted for 345 clusters in
stud_id date)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+----------------------------------------
                                  pm25_pref |     -0.607      0.123
-4.925   0.000
                            temp_daily_avg |     51.080      5.856
8.723   0.000
                          precip_daily_avg |   4188.076    331.554
12.632   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -6.623      0.543
-12.197   0.000
                                            |
                          relhum_daily_avg |      0.648      2.983
0.217   0.828
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.011      0.005
2.285   0.022
                                            |
                           press_daily_avg |      6.509      2.162
3.011   0.003
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.503      0.057
-8.844   0.000
                                            |
                     winddir_cos_daily_avg |   -232.091     21.745
-10.673   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.259      0.023
11.280   0.000
                                            |
                     winddir_sin_daily_avg |    271.679     23.447
11.587   0.000
                                            |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.398   0.000
                                            |
     c.precip_daily_avg#c.relhum_daily_avg |      0.597      0.312
1.913   0.056
```

```
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -42.108      3.201
-13.156   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.750      0.439
-3.985   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.337      0.957
7.667   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.008      0.030
-0.285   0.775
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.395   0.693
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.160      0.014
-11.819   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.334      0.211
11.068   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.610      0.228
-11.460   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est3 stored)
.
. esttab using table_12.tex, ///
> keep(*pm25*) ///
> star(* 0.10 ** 0.05 *** 0.01) label stats(N, fmt(%9.0fc)
labels("Observations")) ///
> mtitle("\shortstack{Clust.\\ Stud. x Slot}" "\shortstack{Clust. \\
Student}" "\shortstack{Clust.\\ Stud. x Date}" ) ///
> compress se(5) b(5) replace nogaps noomitted ///
> indicate( ///
> "Weather Controls = temp_daily_avg" ///
> "Weather Interactions = *#c.precip_daily_avg*" ///
```

```
> , labels("Y" " ")) ///
> nonotes
(file table_12.tex not found)
(output written to table_12.tex)
.
. log close
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_12.log
  log type:  text
 closed on:  23 Feb 2023, 13:52:35
-------------------------------------------------------------------------
-------------------------------------------------------------
-------------------------------------------------------------------------
-------------------------------------------------------------
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_a1a.log
  log type:  text
 opened on:  23 Feb 2023, 13:52:35
. * table_a1_a
.
. eststo clear
. eststo: reghdfe percent pm25_pref pm25_lead_1_day-pm25_lead_1_day
`controls2' , absorb(`absorb1') vce(clust `cluster') `displa
> y_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
```

```
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  22,   1025) =
88.05
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1040

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                             |               Robust
                                     percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                   pm25_pref |     -1.120      0.132
-8.487   0.000
                            pm25_lead_1_day |      1.356      0.119
11.366   0.000
                             temp_daily_avg |     48.624      5.873
8.279   0.000
                           precip_daily_avg |   4163.806    332.437
12.525   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -7.557      0.550
-13.733   0.000
                                             |
                           relhum_daily_avg |     -0.194      2.993
-0.065   0.948
                                             |
```

```
       c.temp_daily_avg#c.relhum_daily_avg |      0.025      0.005
5.082   0.000
                                           |
                           press_daily_avg |      4.936      2.173
2.272   0.023
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.486      0.057
-8.516   0.000
                                           |
                    winddir_cos_daily_avg |   -252.370     21.873
-11.538   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.266      0.023
11.583   0.000
                                           |
                    winddir_sin_daily_avg |    267.149     23.547
11.345   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.330   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.439      0.313
1.403   0.161
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -41.685      3.209
-12.988   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.815      0.441
-4.113   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.405      0.961
7.709   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.000      0.030
-0.014   0.989
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.004      0.011
0.364   0.716
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.157      0.014
-11.570   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.530      0.212
11.929   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.566      0.229
-11.218   0.000
------------------------------------------------------------------------
-------------
```

```
Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est1 stored)
. eststo: reghdfe percent pm25_pref pm25_lead_1_day-pm25_lead_2_day
`controls2' , absorb(`absorb1') vce(clust `cluster') `displa
> y_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
```

```
HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
87.02
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0941

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                             |               Robust
                                     percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                   pm25_pref |     -0.915      0.134
-6.853   0.000
                            pm25_lead_1_day |      0.923      0.128
7.182   0.000
                            pm25_lead_2_day |      0.989      0.112
8.829   0.000
                             temp_daily_avg |     47.144      5.876
8.023   0.000
                           precip_daily_avg |   4237.667    332.566
12.742   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -7.592      0.550
-13.796   0.000
                                             |
                           relhum_daily_avg |     -2.095      3.002
-0.698   0.485
                                             |
       c.temp_daily_avg#c.relhum_daily_avg |      0.027      0.005
5.372   0.000
                                             |
                            press_daily_avg |      3.803      2.177
1.747   0.081
                                             |
        c.temp_daily_avg#c.press_daily_avg |     -0.471      0.057
-8.259   0.000
                                             |
```

```
                    winddir_cos_daily_avg |   -256.188     21.879
-11.710   0.000
                                          |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.259      0.023
11.273   0.000
                                          |
                    winddir_sin_daily_avg |    286.395     23.650
12.109   0.000
                                          |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.502      0.025
-19.985   0.000
                                          |
     c.precip_daily_avg#c.relhum_daily_avg |      0.400      0.313
1.279   0.201
                                          |
      c.precip_daily_avg#c.press_daily_avg |    -42.389      3.211
-13.202   0.000
                                          |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.783      0.441
-4.039   0.000
                                          |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.088      0.961
7.373   0.000
                                          |
      c.relhum_daily_avg#c.press_daily_avg |      0.019      0.030
0.630   0.529
                                          |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.004      0.011
0.316   0.752
                                          |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.164      0.014
-12.018   0.000
                                          |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.568      0.212
12.104   0.000
                                          |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.753      0.230
-11.983   0.000
------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
```

```
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)
. eststo: reghdfe percent pm25_pref pm25_lead_1_day-pm25_lead_3_day
`controls2' , absorb(`absorb1') vce(clust `cluster') `displa
> y_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  24,   1025) =
88.32
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
```

```
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0801

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------+----------------------------------
                                  pm25_pref |     -0.889      0.134
-6.654   0.000
                             pm25_lead_1_day |      1.287      0.133
9.663   0.000
                             pm25_lead_2_day |      0.401      0.125
3.219   0.001
                             pm25_lead_3_day |      1.232      0.116
10.613   0.000
                              temp_daily_avg |     44.641      5.882
7.589   0.000
                            precip_daily_avg |   3993.863    333.448
11.977   0.000
                                            |
       c.temp_daily_avg#c.precip_daily_avg |     -7.154      0.552
-12.958   0.000
                                            |
                            relhum_daily_avg |     -0.706      3.005
-0.235   0.814
                                            |
       c.temp_daily_avg#c.relhum_daily_avg |      0.037      0.005
7.184   0.000
                                            |
                              press_daily_avg |      5.033      2.180
2.308   0.021
                                            |
        c.temp_daily_avg#c.press_daily_avg |     -0.452      0.057
-7.916   0.000
                                            |
                         winddir_cos_daily_avg |   -237.806     21.936
-10.841   0.000
                                            |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.240      0.023
10.393   0.000
                                            |
                         winddir_sin_daily_avg |    297.239     23.671
```

```
12.557   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.492      0.025
-19.577   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.559      0.313
1.785   0.074
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -40.088      3.219
-12.454   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.088      0.442
-4.719   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.995      0.961
7.276   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |      0.004      0.030
0.145   0.885
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.003      0.011
-0.222   0.824
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.171      0.014
-12.529   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.390      0.213
11.238   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.856      0.230
-12.420   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est3 stored)
. eststo: reghdfe percent pm25_pref pm25_lead_1_day-pm25_lead_4_day
`controls2' , absorb(`absorb1') vce(clust `cluster') `displa
> y_options'
(dropped 1175 singleton observations)
```

```
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  25,   1025) =
87.45
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0711

                      (Std. err. adjusted for 1,026 clusters in
```

```
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                                |               Robust
                                        percent | Coefficient  std. err.
t    P>|t|
-----------------------------------------------
+-----------------------------------------
                                     pm25_pref |     -0.717      0.135
-5.307   0.000
                              pm25_lead_1_day |      1.259      0.133
9.449   0.000
                              pm25_lead_2_day |      0.684      0.129
5.290   0.000
                              pm25_lead_3_day |      0.730      0.130
5.592   0.000
                              pm25_lead_4_day |      1.018      0.119
8.562   0.000
                               temp_daily_avg |     43.838      5.884
7.451   0.000
                             precip_daily_avg |   3946.825    333.538
11.833   0.000
                                                |
       c.temp_daily_avg#c.precip_daily_avg |     -6.418      0.559
-11.484   0.000
                                                |
                             relhum_daily_avg |     -1.099      3.005
-0.366   0.714
                                                |
       c.temp_daily_avg#c.relhum_daily_avg |      0.036      0.005
7.027   0.000
                                                |
                              press_daily_avg |      4.664      2.180
2.139   0.032
                                                |
        c.temp_daily_avg#c.press_daily_avg |     -0.443      0.057
-7.762   0.000
                                                |
                         winddir_cos_daily_avg |   -235.445     21.932
-10.735   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.255      0.023
10.981   0.000
                                                |
                         winddir_sin_daily_avg |    294.761     23.672
12.452   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.517      0.025
-20.420   0.000
                                                |
```

```
     c.precip_daily_avg#c.relhum_daily_avg |      0.691      0.314
2.203   0.028
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -39.775      3.219
-12.354   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.372      0.444
-5.346   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.600      0.977
5.730   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |      0.008      0.030
0.271   0.787
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.002      0.011
-0.141   0.888
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.164      0.014
-12.046   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.366      0.213
11.124   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.832      0.230
-12.320   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est4 stored)
. eststo: reghdfe percent pm25_pref pm25_lead_1_day-pm25_lead_5_day
`controls2' , absorb(`absorb1') vce(clust `cluster') `displa
> y_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  26,   1025) =
84.25
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0703

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                        |               Robust
                                percent | Coefficient  std. err.
```

```
t    P>|t|
------------------------------------------
+-------------------------------------
                                 pm25_pref |     -0.742      0.135
-5.480   0.000
                          pm25_lead_1_day |      1.315      0.135
9.732   0.000
                          pm25_lead_2_day |      0.667      0.129
5.155   0.000
                          pm25_lead_3_day |      0.829      0.136
6.098   0.000
                          pm25_lead_4_day |      0.832      0.139
5.999   0.000
                          pm25_lead_5_day |      0.311      0.117
2.658   0.008
                           temp_daily_avg |     43.849      5.884
7.453   0.000
                         precip_daily_avg |   3960.783    333.572
11.874   0.000
                                          |
       c.temp_daily_avg#c.precip_daily_avg |     -6.283      0.561
-11.197   0.000
                                          |
                         relhum_daily_avg |     -1.488      3.009
-0.495   0.621
                                          |
       c.temp_daily_avg#c.relhum_daily_avg |      0.036      0.005
7.108   0.000
                                          |
                          press_daily_avg |      4.404      2.183
2.018   0.044
                                          |
        c.temp_daily_avg#c.press_daily_avg |     -0.443      0.057
-7.764   0.000
                                          |
                     winddir_cos_daily_avg |   -234.305     21.931
-10.684   0.000
                                          |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.256      0.023
11.044   0.000
                                          |
                     winddir_sin_daily_avg |    304.450     23.956
12.709   0.000
                                          |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.523      0.025
-20.567   0.000
                                          |
     c.precip_daily_avg#c.relhum_daily_avg |      0.693      0.314
2.209   0.027
                                          |
```

```
      c.precip_daily_avg#c.press_daily_avg |    -39.922      3.220
-12.399   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.382      0.444
-5.369   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.430      0.980
5.543   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |      0.012      0.030
0.399   0.690
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.001      0.011
-0.085   0.932
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.168      0.014
-12.255   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.354      0.213
11.069   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.926      0.233
-12.578   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est5 stored)
. eststo: reghdfe percent pm25_pref pm25_lead_1_day-pm25_lead_6_day
`controls2' , absorb(`absorb1') vce(clust `cluster') `displa
> y_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
```

```
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  27,   1025) =
81.53
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0688

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                          |               Robust
                                  percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
```

```
                                  pm25_pref |     -0.700      0.136
-5.149   0.000
                              pm25_lead_1_day |      1.270      0.136
9.366   0.000
                              pm25_lead_2_day |      0.767      0.132
5.787   0.000
                              pm25_lead_3_day |      0.796      0.136
5.836   0.000
                              pm25_lead_4_day |      0.991      0.146
6.794   0.000
                              pm25_lead_5_day |      0.053      0.137
0.392   0.695
                              pm25_lead_6_day |      0.433      0.118
3.667   0.000
                               temp_daily_avg |     43.357      5.886
7.367   0.000
                             precip_daily_avg |   4061.419    334.951
12.125   0.000
                                              |
       c.temp_daily_avg#c.precip_daily_avg |     -6.203      0.561
-11.049   0.000
                                              |
                             relhum_daily_avg |     -1.915      3.010
-0.636   0.525
                                              |
       c.temp_daily_avg#c.relhum_daily_avg |      0.036      0.005
7.008   0.000
                                              |
                              press_daily_avg |      4.220      2.183
1.933   0.053
                                              |
        c.temp_daily_avg#c.press_daily_avg |     -0.438      0.057
-7.664   0.000
                                              |
                      winddir_cos_daily_avg |   -235.675     21.938
-10.743   0.000
                                              |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.256      0.023
11.031   0.000
                                              |
                      winddir_sin_daily_avg |    310.225     23.999
12.927   0.000
                                              |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.526      0.025
-20.686   0.000
                                              |
     c.precip_daily_avg#c.relhum_daily_avg |      0.646      0.314
2.057   0.040
                                              |
      c.precip_daily_avg#c.press_daily_avg |    -40.899      3.233
```

```
-12.650   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.501      0.445
-5.621   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.411      0.979
5.524   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |      0.016      0.030
0.543   0.587
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.002      0.011
-0.194   0.846
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.169      0.014
-12.296   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.368      0.213
11.134   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.984      0.233
-12.800   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est6 stored)
. eststo: reghdfe percent pm25_pref pm25_lead_1_day-pm25_lead_7_day
`controls2' , absorb(`absorb1') vce(clust `cluster') `displa
> y_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
```

```
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  28,   1025) =
87.19
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4610
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0014
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0368

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
             |                                                 Robust
             |      percent | Coefficient  std. err.
t    P>|t|
-------------+----------------------------------------------
+----------------------------------------
             |
             |
             |
```

```
-3.596   0.000
                          pm25_lead_1_day |      1.389      0.136
10.224   0.000
                          pm25_lead_2_day |      0.650      0.133
4.895   0.000
                          pm25_lead_3_day |      1.107      0.138
8.012   0.000
                          pm25_lead_4_day |      0.807      0.146
5.512   0.000
                          pm25_lead_5_day |      0.615      0.141
4.356   0.000
                          pm25_lead_6_day |     -0.814      0.142
-5.713   0.000
                          pm25_lead_7_day |      2.068      0.130
15.937   0.000
                           temp_daily_avg |     48.516      5.894
8.232   0.000
                         precip_daily_avg |   3732.845    335.808
11.116   0.000
                                          |
       c.temp_daily_avg#c.precip_daily_avg |     -6.940      0.563
-12.325   0.000
                                          |
                         relhum_daily_avg |      3.016      3.028
0.996   0.319
                                          |
       c.temp_daily_avg#c.relhum_daily_avg |      0.027      0.005
5.301   0.000
                                          |
                          press_daily_avg |      7.664      2.194
3.493   0.000
                                          |
        c.temp_daily_avg#c.press_daily_avg |     -0.483      0.057
-8.440   0.000
                                          |
                      winddir_cos_daily_avg |   -197.607     22.074
-8.952   0.000
                                          |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.243      0.023
10.449   0.000
                                          |
                      winddir_sin_daily_avg |    304.723     23.998
12.698   0.000
                                          |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.514      0.025
-20.197   0.000
                                          |
     c.precip_daily_avg#c.relhum_daily_avg |      0.720      0.314
2.292   0.022
                                          |
```

```
      c.precip_daily_avg#c.press_daily_avg |    -37.596      3.242
-11.597   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.793      0.447
-4.012   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.985      0.980
6.107   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.033      0.030
-1.083   0.279
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.003      0.011
0.256   0.798
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.183      0.014
-13.329   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      1.986      0.214
9.272   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.920      0.233
-12.529   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est7 stored)
.
. esttab using table_a1_a.tex, ///
> keep(*pm25_pref*) ///
> star(* 0.10 ** 0.05 *** 0.01) label stats(N, fmt(%9.0fc)
labels("Observations")) ///
> mtitle( "\shortstack{1 Lead}""\shortstack{2 Leads}""\shortstack{3
Leads}""\shortstack{4 Leads}""\shortstack{5 Leads}""\shortsta
> ck{6 Leads}""\shortstack{7 Leads}") ///
> compress se(3) b(3) replace nogaps noomitted ///
> indicate( ///
> "Weather Controls = temp_daily_avg" ///
> "Weather Interactions = *#c.precip_daily_avg*" ///
```

```
> , labels("Y" " ")) ///
> nonotes
(file table_a1_a.tex not found)
(output written to table_a1_a.tex)
.
. log close
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_a1a.log
  log type:  text
 closed on:  23 Feb 2023, 14:07:57
-------------------------------------------------------------------------------
-------------------------------------------------------------
-------------------------------------------------------------------------------
-------------------------------------------------------------
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_a1b.log
  log type:  text
 opened on:  23 Feb 2023, 14:07:57
. * table_a1_b
.
. eststo clear
. eststo: reghdfe percent pm25_pref pm25_lag_1_day-pm25_lag_1_day
pm25_lead_1_day-pm25_lead_1_day  `controls2' , absorb(`absorb1'
> ) vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
```

```
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  23,   1025) =
84.34
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4608
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0011
Number of clusters (date_slot) =      1,026       Root MSE        =
441.1038

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                             |               Robust
                                     percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                  pm25_pref |     -1.065      0.137
-7.764   0.000
                            pm25_lag_1_day |     -0.185      0.122
-1.511   0.131
                           pm25_lead_1_day |      1.339      0.120
11.153   0.000
                            temp_daily_avg |     49.166      5.885
8.354   0.000
                          precip_daily_avg |   4205.161    333.429
12.612   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -7.685      0.556
-13.820   0.000
                                             |
                          relhum_daily_avg |     -0.352      2.994
```

```
-0.117   0.907
                                                 |
       c.temp_daily_avg#c.relhum_daily_avg |      0.027      0.005
5.296   0.000
                                                 |
                            press_daily_avg |      4.955      2.173
2.281   0.023
                                                 |
        c.temp_daily_avg#c.press_daily_avg |     -0.492      0.057
-8.599   0.000
                                                 |
                      winddir_cos_daily_avg |   -255.863     22.009
-11.625   0.000
                                                 |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.268      0.023
11.634   0.000
                                                 |
                      winddir_sin_daily_avg |    267.614     23.548
11.365   0.000
                                                 |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.484      0.025
-19.333   0.000
                                                 |
     c.precip_daily_avg#c.relhum_daily_avg |      0.418      0.313
1.333   0.182
                                                 |
      c.precip_daily_avg#c.press_daily_avg |    -42.075      3.219
-13.072   0.000
                                                 |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.785      0.442
-4.041   0.000
                                                 |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.357      0.961
7.653   0.000
                                                 |
      c.relhum_daily_avg#c.press_daily_avg |      0.001      0.030
0.038   0.970
                                                 |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.004      0.011
0.369   0.712
                                                 |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.157      0.014
-11.582   0.000
                                                 |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.565      0.213
12.014   0.000
                                                 |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.570      0.229
-11.237   0.000
------------------------------------------------------------------------------
```

```
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est1 stored)
. eststo: reghdfe percent pm25_pref pm25_lag_1_day-pm25_lag_2_day
pm25_lead_1_day-pm25_lead_2_day  `controls2' , absorb(`absorb1'
> ) vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
```

```
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  25,   1025) =
84.09
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4874
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,957         Within R-sq.    =
0.0012
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0823

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                             |               Robust
                                     percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+----------------------------------------
                                  pm25_pref |     -1.141      0.142
-8.005   0.000
                            pm25_lag_1_day |      0.171      0.130
1.318   0.188
                            pm25_lag_2_day |     -1.069      0.114
-9.389   0.000
                           pm25_lead_1_day |      0.929      0.129
7.179   0.000
                           pm25_lead_2_day |      0.730      0.116
6.297   0.000
                            temp_daily_avg |     51.352      5.894
8.713   0.000
                          precip_daily_avg |   4325.957    333.633
12.966   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -7.601      0.557
-13.655   0.000
                                             |
                          relhum_daily_avg |      0.802      3.019
0.266   0.791
                                             |
       c.temp_daily_avg#c.relhum_daily_avg |      0.028      0.005
5.510   0.000
                                             |
```

```
                           press_daily_avg |      6.555      2.193
2.990   0.003
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.513      0.057
-8.961   0.000
                                           |
                      winddir_cos_daily_avg |   -250.728     22.027
-11.383   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.269      0.023
11.661   0.000
                                           |
                      winddir_sin_daily_avg |    271.443     23.723
11.442   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.521      0.025
-20.657   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.178      0.314
0.567   0.571
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -43.092      3.220
-13.381   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -1.813      0.442
-4.104   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.280      0.962
7.564   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.010      0.030
-0.341   0.733
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.003      0.011
0.298   0.766
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.167      0.014
-12.239   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.513      0.214
11.763   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.602      0.230
-11.289   0.000
------------------------------------------------------------------------
------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
```

```
-------------+----------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-------------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est2 stored)
. eststo: reghdfe percent pm25_pref pm25_lag_1_day-pm25_lag_3_day
pm25_lead_1_day-pm25_lead_3_day  `controls2' , absorb(`absorb1'
> ) vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  27,   1025) =
```

```
82.81
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0664

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                             |               Robust
                                     percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-------------------------------------
                                  pm25_pref |     -1.171      0.144
-8.125   0.000
                            pm25_lag_1_day |      0.337      0.136
2.485   0.013
                            pm25_lag_2_day |     -1.128      0.126
-8.976   0.000
                            pm25_lag_3_day |     -0.114      0.119
-0.959   0.338
                           pm25_lead_1_day |      1.301      0.142
9.181   0.000
                           pm25_lead_2_day |      0.081      0.131
0.615   0.538
                           pm25_lead_3_day |      1.312      0.119
11.067   0.000
                            temp_daily_avg |     48.302      5.907
8.177   0.000
                          precip_daily_avg |   4031.734    334.744
12.044   0.000
                                             |
       c.temp_daily_avg#c.precip_daily_avg |     -6.994      0.559
-12.502   0.000
                                             |
                          relhum_daily_avg |      2.751      3.024
0.910   0.363
                                             |
       c.temp_daily_avg#c.relhum_daily_avg |      0.037      0.005
7.191   0.000
                                             |
                           press_daily_avg |      8.192      2.198
```

```
3.728   0.000
                                                |
        c.temp_daily_avg#c.press_daily_avg |     -0.488      0.057
-8.512   0.000
                                                |
                      winddir_cos_daily_avg |   -226.008     22.124
-10.215   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.248      0.023
10.701   0.000
                                                |
                      winddir_sin_daily_avg |    282.434     23.778
11.878   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.513      0.025
-20.324   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.353      0.314
1.123   0.262
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -40.306      3.231
-12.475   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.158      0.443
-4.867   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      7.240      0.963
7.522   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.030      0.030
-1.009   0.313
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.004      0.011
-0.380   0.704
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.175      0.014
-12.837   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.274      0.215
10.595   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.705      0.231
-11.711   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
```

```
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-------------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est3 stored)
. eststo: reghdfe percent pm25_pref pm25_lag_1_day-pm25_lag_4_day
pm25_lead_1_day-pm25_lead_4_day  `controls2' , absorb(`absorb1'
> ) vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  29,   1025) =
78.86
```

```
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0597

                      (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
-------------
                                           |               Robust
                                   percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------
                                pm25_pref |     -1.107      0.153
-7.241   0.000
                           pm25_lag_1_day |      0.285      0.138
2.059   0.039
                           pm25_lag_2_day |     -1.126      0.130
-8.637   0.000
                           pm25_lag_3_day |      0.139      0.130
1.067   0.286
                           pm25_lag_4_day |     -0.353      0.118
-2.993   0.003
                          pm25_lead_1_day |      1.332      0.142
9.357   0.000
                          pm25_lead_2_day |      0.319      0.138
2.312   0.021
                          pm25_lead_3_day |      0.844      0.135
6.241   0.000
                          pm25_lead_4_day |      0.807      0.123
6.542   0.000
                           temp_daily_avg |     48.445      5.910
8.197   0.000
                         precip_daily_avg |   3867.756    338.611
11.422   0.000
                                           |
       c.temp_daily_avg#c.precip_daily_avg |     -6.449      0.564
-11.425   0.000
                                           |
                         relhum_daily_avg |      2.196      3.027
0.726   0.468
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.036      0.005
```

```
6.942   0.000
                                                |
                                press_daily_avg |      7.693      2.200
3.496   0.000
                                                |
        c.temp_daily_avg#c.press_daily_avg |     -0.488      0.057
-8.511   0.000
                                                |
                        winddir_cos_daily_avg |   -231.461     22.160
-10.445   0.000
                                                |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.257      0.023
11.030   0.000
                                                |
                        winddir_sin_daily_avg |    285.678     23.827
11.990   0.000
                                                |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.533      0.025
-20.981   0.000
                                                |
     c.precip_daily_avg#c.relhum_daily_avg |      0.544      0.316
1.722   0.085
                                                |
      c.precip_daily_avg#c.press_daily_avg |    -38.852      3.268
-11.890   0.000
                                                |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.379      0.445
-5.352   0.000
                                                |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.027      0.981
6.143   0.000
                                                |
      c.relhum_daily_avg#c.press_daily_avg |     -0.025      0.030
-0.827   0.408
                                                |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.003      0.011
-0.256   0.798
                                                |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.174      0.014
-12.624   0.000
                                                |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.327      0.215
10.825   0.000
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.736      0.231
-11.822   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
```

```
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est4 stored)
. eststo: reghdfe percent pm25_pref pm25_lag_1_day-pm25_lag_5_day
pm25_lead_1_day-pm25_lead_5_day  `controls2' , absorb(`absorb1'
> ) vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
```

```
1,806,513
Absorbing 4 HDFE groups                          F(  31,   1025) =
74.78
Statistics robust to heteroskedasticity          Prob > F        =
0.0000
                                                 R-squared       =
0.4875
                                                 Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959        Within R-sq.    =
0.0013
Number of clusters (date_slot) =      1,026      Root MSE        =
441.0558

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                            |               Robust
                                    percent | Coefficient  std. err.
t    P>|t|
---------------------------------------------
+-----------------------------------------
                                  pm25_pref |     -1.084      0.153
-7.088   0.000
                            pm25_lag_1_day |      0.097      0.143
0.676   0.499
                            pm25_lag_2_day |     -1.020      0.134
-7.619   0.000
                            pm25_lag_3_day |     -0.056      0.135
-0.412   0.680
                            pm25_lag_4_day |     -0.048      0.131
-0.365   0.715
                            pm25_lag_5_day |     -0.690      0.122
-5.638   0.000
                           pm25_lead_1_day |      1.320      0.144
9.161   0.000
                           pm25_lead_2_day |      0.165      0.141
1.173   0.241
                           pm25_lead_3_day |      0.888      0.142
6.249   0.000
                           pm25_lead_4_day |      0.695      0.143
4.873   0.000
                           pm25_lead_5_day |     -0.034      0.125
-0.271   0.787
                            temp_daily_avg |     50.313      5.919
8.500   0.000
                          precip_daily_avg |   3849.253    338.779
11.362   0.000
                                            |
```

```
       c.temp_daily_avg#c.precip_daily_avg |     -6.780      0.571
-11.870   0.000
                                           |
                           relhum_daily_avg |      3.430      3.044
1.127   0.260
                                           |
       c.temp_daily_avg#c.relhum_daily_avg |      0.036      0.005
6.879   0.000
                                           |
                            press_daily_avg |      8.234      2.210
3.726   0.000
                                           |
        c.temp_daily_avg#c.press_daily_avg |     -0.507      0.057
-8.812   0.000
                                           |
                       winddir_cos_daily_avg |   -220.994     22.239
-9.937   0.000
                                           |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.252      0.023
10.828   0.000
                                           |
                       winddir_sin_daily_avg |    275.731     24.221
11.384   0.000
                                           |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.518      0.026
-20.241   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.424      0.317
1.340   0.180
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -38.556      3.270
-11.792   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.728      0.449
-6.077   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      5.984      0.983
6.085   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.037      0.030
-1.227   0.220
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.005      0.012
-0.405   0.686
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.166      0.014
-11.958   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.225      0.216
10.312   0.000
```

```
                                                |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.643      0.235
-11.236   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est5 stored)
. eststo: reghdfe percent pm25_pref pm25_lag_1_day-pm25_lag_6_day
pm25_lead_1_day-pm25_lead_6_day  `controls2' , absorb(`absorb1'
> ) vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
```

```
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  33,   1025) =
71.14
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4609
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0014
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0521

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------------
             |                               Robust
             |      percent | Coefficient  std. err.
t    P>|t|
-------------+----------------------------------------
+----------------------------------------
             |      pm25_pref |     -1.181      0.156
-7.587   0.000
             |  pm25_lag_1_day |      0.138      0.145
0.953   0.341
             |  pm25_lag_2_day |     -1.212      0.138
-8.764   0.000
             |  pm25_lag_3_day |      0.039      0.137
0.282   0.778
             |  pm25_lag_4_day |     -0.219      0.139
-1.568   0.117
             |  pm25_lag_5_day |     -0.452      0.130
-3.487   0.000
             |  pm25_lag_6_day |     -0.633      0.127
-4.997   0.000
             | pm25_lead_1_day |      1.165      0.147
7.927   0.000
             | pm25_lead_2_day |      0.187      0.145
1.290   0.197
             | pm25_lead_3_day |      0.793      0.143
5.543   0.000
```

```
                          pm25_lead_4_day |      0.659      0.154
4.286   0.000
                          pm25_lead_5_day |     -0.216      0.140
-1.540   0.124
                          pm25_lead_6_day |      0.152      0.130
1.172   0.241
                           temp_daily_avg |     48.159      5.934
8.115   0.000
                         precip_daily_avg |   3963.823    341.349
11.612   0.000
                                          |
       c.temp_daily_avg#c.precip_daily_avg |     -6.880      0.574
-11.987   0.000
                                          |
                         relhum_daily_avg |      3.284      3.049
1.077   0.281
                                          |
       c.temp_daily_avg#c.relhum_daily_avg |      0.033      0.005
6.336   0.000
                                          |
                          press_daily_avg |      8.071      2.212
3.649   0.000
                                          |
        c.temp_daily_avg#c.press_daily_avg |     -0.483      0.058
-8.381   0.000
                                          |
                      winddir_cos_daily_avg |   -219.097     22.249
-9.848   0.000
                                          |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.255      0.023
10.955   0.000
                                          |
                      winddir_sin_daily_avg |    271.434     24.315
11.163   0.000
                                          |
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.522      0.026
-20.344   0.000
                                          |
     c.precip_daily_avg#c.relhum_daily_avg |      0.359      0.317
1.130   0.258
                                          |
      c.precip_daily_avg#c.press_daily_avg |    -39.665      3.295
-12.038   0.000
                                          |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.986      0.452
-6.606   0.000
                                          |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.272      0.986
6.364   0.000
                                          |
```

```
      c.relhum_daily_avg#c.press_daily_avg |     -0.035      0.030
-1.167   0.243
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |     -0.002      0.012
-0.190   0.849
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.166      0.014
-11.933   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      2.205      0.216
10.217   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.600      0.236
-11.010   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est6 stored)
. eststo: reghdfe percent pm25_pref pm25_lag_1_day-pm25_lag_7_day
pm25_lead_1_day-pm25_lead_7_day  `controls2' , absorb(`absorb1'
> ) vce(clust `cluster') `display_options'
(dropped 1175 singleton observations)
(MWFE estimator converged in 12 iterations)
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: temp_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
```

```
note: precip_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: precip_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: relhum_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_cos_daily_avg omitted because of collinearity
note: press_daily_avg omitted because of collinearity
note: winddir_sin_daily_avg omitted because of collinearity

HDFE Linear regression                            Number of obs   =
1,806,513
Absorbing 4 HDFE groups                           F(  35,   1025) =
71.36
Statistics robust to heteroskedasticity           Prob > F        =
0.0000
                                                  R-squared       =
0.4875
                                                  Adj R-squared   =
0.4610
Number of clusters (stud_id) =     88,959         Within R-sq.    =
0.0015
Number of clusters (date_slot) =      1,026       Root MSE        =
441.0314

                       (Std. err. adjusted for 1,026 clusters in
stud_id date_slot)
------------------------------------------------------------------------
-------------
                                           |               Robust
                                   percent | Coefficient  std. err.
t    P>|t|
-------------------------------------------
+-----------------------------------------
                                 pm25_pref |     -0.756      0.161
-4.698   0.000
                            pm25_lag_1_day |      0.077      0.147
0.520   0.603
                            pm25_lag_2_day |     -0.804      0.142
-5.676   0.000
                            pm25_lag_3_day |      0.200      0.142
1.410   0.159
                            pm25_lag_4_day |      0.001      0.141
```

```
0.010   0.992
                          pm25_lag_5_day |     -0.240      0.138
-1.746   0.081
                          pm25_lag_6_day |     -0.368      0.136
-2.706   0.007
                          pm25_lag_7_day |      0.051      0.128
0.399   0.690
                         pm25_lead_1_day |      1.374      0.148
9.268   0.000
                         pm25_lead_2_day |      0.328      0.145
2.252   0.024
                         pm25_lead_3_day |      1.105      0.148
7.486   0.000
                         pm25_lead_4_day |      0.703      0.154
4.571   0.000
                         pm25_lead_5_day |      0.362      0.149
2.437   0.015
                         pm25_lead_6_day |     -0.742      0.148
-5.031   0.000
                         pm25_lead_7_day |      1.807      0.141
12.859   0.000
                          temp_daily_avg |     51.323      5.952
8.622   0.000
                        precip_daily_avg |   3800.007    341.727
11.120   0.000
                                         |
       c.temp_daily_avg#c.precip_daily_avg |     -7.267      0.575
-12.648   0.000
                                         |
                        relhum_daily_avg |      5.317      3.055
1.741   0.082
                                         |
       c.temp_daily_avg#c.relhum_daily_avg |      0.028      0.005
5.263   0.000
                                         |
                         press_daily_avg |      9.385      2.215
4.237   0.000
                                         |
        c.temp_daily_avg#c.press_daily_avg |     -0.511      0.058
-8.828   0.000
                                         |
                     winddir_cos_daily_avg |   -194.243     22.372
-8.682   0.000
                                         |
  c.temp_daily_avg#c.winddir_cos_daily_avg |      0.246      0.023
10.556   0.000
                                         |
                     winddir_sin_daily_avg |    279.411     24.331
11.484   0.000
                                         |
```

```
  c.temp_daily_avg#c.winddir_sin_daily_avg |     -0.512      0.026
-19.953   0.000
                                           |
     c.precip_daily_avg#c.relhum_daily_avg |      0.493      0.318
1.552   0.121
                                           |
      c.precip_daily_avg#c.press_daily_avg |    -38.085      3.298
-11.547   0.000
                                           |
c.precip_daily_avg#c.winddir_cos_daily_avg |     -2.209      0.456
-4.843   0.000
                                           |
c.precip_daily_avg#c.winddir_sin_daily_avg |      6.402      0.987
6.483   0.000
                                           |
      c.relhum_daily_avg#c.press_daily_avg |     -0.055      0.030
-1.827   0.068
                                           |
c.relhum_daily_avg#c.winddir_cos_daily_avg |      0.005      0.012
0.402   0.688
                                           |
c.relhum_daily_avg#c.winddir_sin_daily_avg |     -0.176      0.014
-12.647   0.000
                                           |
 c.press_daily_avg#c.winddir_cos_daily_avg |      1.952      0.217
8.988   0.000
                                           |
 c.press_daily_avg#c.winddir_sin_daily_avg |     -2.673      0.236
-11.313   0.000
------------------------------------------------------------------------------
-------------

Absorbed degrees of freedom:
-----------------------------------------------------+
 Absorbed FE | Categories  - Redundant  = Num. Coefs |
-------------+---------------------------------------|
     stud_id |     88959       88959           0    *|
        slot |         3           0           3     |
         dow |         7           1           6     |
        strm |        24           1          23    ?|
-----------------------------------------------------+
? = number of redundant parameters may be higher
* = FE nested within cluster; treated as redundant for DoF computation
(est7 stored)
.
. esttab using table_a1_b.tex, ///
> keep(*pm25_pref*) ///
> star(* 0.10 ** 0.05 *** 0.01) label stats(N, fmt(%9.0fc)
labels("Observations")) ///
> mtitle( "\shortstack{1 L+L}""\shortstack{2 L+L}""\shortstack{3
```

```
L+L}""\shortstack{4 L+L}""\shortstack{5 L+L}""\shortstack{6 L+L}
> ""\shortstack{7 L+L}") ///
> compress se(3) b(3) replace nogaps noomitted ///
> indicate( ///
> "Weather Controls = temp_daily_avg" ///
> "Weather Interactions = *#c.precip_daily_avg*" ///
> , labels("Y" " ")) ///
> nonotes
(file table_a1_b.tex not found)
(output written to table_a1_b.tex)
.
. log close
      name:  <unnamed>
       log:  /Users/nikolai/Dropbox/Research/Pollution Grades
Revision/Replication/log_table_a1b.log
  log type:  text
 closed on:  23 Feb 2023, 14:24:19
-------------------------------------------------------------------------
-------------------------------------------------------------
```