
Problem Set 4 *Solutions*

Question 1. This problem will use regression difference-in-differences to estimate the impact of a breakfast in the classroom (BIC) program on school meals program participation in New York City. BIC was not implemented under random assignment; rather, schools voluntarily adopted the program. We do, however, have data for these and other schools before and after adoption. (See Corcoran, Elbel, & Schwartz 2015 for details). **(51 points)**

- (a) In Stata, open the panel dataset called *NYCbkfastlunch.dta* from Github:

```
use https://github.com/spcorcor18/LP0-8852/raw/main/data/NYCbkfastlunch.dta, clear
```

This file consists of school-level data in which the rows are elementary or middle schools observed in year t ($t=2005$ to 2012). The outcome variables of interest are *bkfast_part* and *lunch_part*, which are average daily participation rates in the school breakfast and lunch programs. Provide some descriptive statistics for these two variables. On what scale are they measured? **(2 points)**

See below and attached log. Each of the outcome variables ranges between 0-1 and can be interpreted as the proportion of students in attendance on the average school day in school i who received a breakfast or lunch. The average daily participation was 0.777 (or 77.7%) for lunch and only 0.259 (or 25.9%) for breakfast.

```
. // #1  
. summ bkfast_part lunch_part
```

Variable	Obs	Mean	Std. Dev.	Min	Max
bkfast_part	8,061	.2594672	.1446061	.0054945	.9759036
lunch_part	7,790	.7767745	.1836831	.0122249	1

- (b) Stata has a set of *xt* commands that make working with panel data easier. Use *xtset panelvar timevar* to declare the data as a panel. Which variable is the cross-sectional unit (*panelvar*) and which is the time dimension (*timevar*)? Is this a balanced panel? (Use *xtdescribe* to inspect the panel balance). How many schools are observed in all 8 years? **(2 points)**

See attached log. *schoolid* is the cross-sectional unit, while *year* is the time dimension. This is not a balanced panel, as schools vary in the number of years of data available. This is easily seen in *xtdescribe* which shows the pattern of data availability. 957 schools (or 81.1%) have data in all 8 years.

- (c) This dataset contains three types of schools: (1) schools that adopted BIC in 2010 ($bic2010==1$), (2) schools that never adopted BIC ($bicever==0$), and (3) schools that adopted BIC in a year other than 2010 ($bic2010==0$ & $bicever==1$). For parts (c)-(i) we will only work with types (1) and (2). Think of (1) as the treated group and (2) as the untreated group. We are excluding type (3) for now so that the “pre” and “post” periods are clearly defined.

Estimate a difference-in-differences regression that compares mean breakfast participation for the treated and untreated groups in two time periods: before 2010 and 2010-2012. (In other words, do a simple pre-post comparison for the two groups). Do the same for lunch participation. Interpret your results. Did the adoption of BIC have an impact on breakfast or lunch program participation? Is the effect statistically significant? Practically significant? What assumption(s) must be satisfied for this difference-in-differences to be considered a causal effect? **(6 points)**

See attached log. The difference-in-differences ($bic2010 \times post2010$) is positive and statistically significant for breakfast, and statistically insignificant for lunch. In the case of breakfast, average daily participation increased 22.2 percentage points more in schools that adopted BIC (the treated schools) relative to did schools that did not adopt BIC (the untreated schools).

For this estimate to be considered causal, the common trends assumption must be satisfied. That is, the pre-post change in breakfast participation among non-BIC schools must represent what would have occurred in BIC schools had they not been “treated” by adopting the program.

- (d) Compare the mean characteristics of treated and untreated schools. Look at the following: total enrollment, % ELL, % special education, % Asian, % black, % Hispanic, % female, % free lunch eligible ($free1$), % reduced price lunch eligible ($redu1$). How do schools that adopted BIC compare to those that didn’t? **(4 points)**

See attached log. It is clear that schools which adopted BIC in 2010 differ systematically from those that didn’t. They are more disadvantaged on a number of dimensions, including %ELL, %sped, and percent with family income low enough to be eligible for free meals. These differences suggest we should include these covariates in the regressions. Others—such as the race or gender composition of the school—may also help to reduce unexplained variation in the outcome.

- (e) Now estimate the same regression models in part (c), but include the school covariates listed above. How do your estimates of the “BIC effect” change, if at all? (And how are these covariates related to meal participation?) **(4 points)**

See attached log. It appears the inclusion of covariates has little effect on the difference-in-differences estimates for breakfast and lunch participation.

Many of the included covariates are related to meals program participation. For example, *%ELL*, *%sped*, and percent eligible for free meals are all positively related to breakfast participation. *Total enrollment*, *Asian*, *Hispanic*, and *female* shares are all negatively related to breakfast participation.

- (f) Repeat parts (c) and (e), but include a linear time trend in the regression. Center your time variable to be equal to 0 in 2010. How does this affect your impact estimates for BIC, if at all? What assumption(s) must be satisfied for this difference-in-differences to be considered a causal effect? (4 points)

See attached log. Note I first re-centered the *year* variable so that the implementation year (2010) equals zero. (This is arbitrary—one could also let the *time* variable be equal to zero in 2005). The positive and statistically significant time trend in the breakfast models suggests a small but secular trend in breakfast participation. Inclusion of the time trend appears to have had little effect on the difference-in-differences estimates, however, regardless of whether covariates are included. In the first model the estimated coefficient of 0.007 on *time* is interpreted as a 0.007 predicted increase in mean breakfast participation each year, holding other variables in the model constant. For the difference-in-differences estimate to be considered causal, the common trends assumption must hold. That is, *conditional on the linear time trend and other covariates in the model*, pre-post change in breakfast participation among non-BIC schools must represent what would have occurred in BIC schools had they not been treated.

- (g) Repeat part (f) but use year dummies in the regression model in place of the linear time trend. How does this affect your impact estimates for BIC, if at all? Explain why one of the post-2010 year effects is not estimable. (4 points)

See attached log. The year dummies are a more flexible way of capturing annual fluctuations in mean breakfast (or lunch) participation. Their use in this case has little impact on the difference-in-differences estimate. Note that one of the post-2010 year effects is omitted. This is because of perfect collinearity between the *post2010* variable and the three dummies for 2010, 2011, and 2012. (If you know three of these variables, the fourth is also known).

- (h) Next, estimate a two-way fixed effects version of the models in (g). One way to do this is to include separate dummy variables for every school. A preferable approach is to use *xtreg* with the *fe* option. (Be sure you have used the *xtset* command in part b). How do your estimates compare to those in (g)? (5 points)

See attached log. When we used *xtset* in (b), we told Stata that *schoolid* is the cross-sectional unit. The command *xtreg* with the *fe* option estimates

a fixed-effects version of the model. Effectively, each *schoolid* has its own intercept and the BIC effect is estimated using within-school variation in treatment (BIC or not) and within-school variation in meals program participation. This is analogous to the state and year effects MLDA model considered in the in-class exercise. Note the *bic2010* variable is dropped from the estimation since it is perfectly collinear with the school effects. (It is =1 in all years for schools that adopted BIC in 2010). The point estimate for the effect of BIC on breakfast participation is very similar to earlier model specifications: schools that adopted BIC saw their breakfast participation rate increase by 24.4 percentage points more than schools that did not adopt BIC.

- (i) One way to test the common trends assumption (for the pre-period) is to fit an “event study” regression, which estimates a treatment-comparison group difference in every year. To do this, estimate the model described in (h), but instead of the usual difference-in-differences variables, include an interaction of *bic2010* and the year dummies. Use the year prior to treatment as the reference year. How should you interpret the *bic2010*year* interaction effects? Do they provide any evidence that BIC schools were on a different trajectory prior to 2010? (5 points)

See attached log. The coefficients on the *bic2010* x *year* interactions show how the gap in breakfast participation between BIC and non-BIC schools changed in each year, relative to the omitted year (2009). The leading coefficients (2005-2008) are all around -0.05 to -0.06 and are statistically different from zero. There is no obvious trend in these coefficients, with the exception of the “tick up” in 2009. This suggests the two groups of schools were on parallel trends leading up to 2009. It is possible that there is mis-measurement in the data (i.e., some schools adopted BIC in 2009 but are coded as 2010) The command `coefplot` is one way to display the event study coefficients—see log.

- (j) Repeat part (i) but use the `eventdd` command described in class to obtain the event study regression results and graph. (You may have to install this using `ssc install eventdd`). This command also requires installation of another user-written command called `matsort`. (5 points).

See attached log.

- (k) Some schools adopted BIC in years other than 2010. (Do a crosstabulation of *year* and *bicpost* to see this). Using the full dataset (school types 1-3), re-estimate your difference-in-differences model with school fixed effects (as in part h) and include a *BIC* x *post* interaction for BIC schools in years following their adoption. This *bicpost* variable has already been created for you. Try the models without and with covariates, and include year effects since the “post” period varies by school. How do your results compare to the earlier ones? (5 points)

See attached log. The difference-in-differences estimate of 24 percentage points is quite comparable to the earlier ones.

- (l) Repeat the event study regression and graph for the full sample used in part (j), using eventdd. (5 points)

See attached log.

Question 2. For these questions, refer to the recent article by Cellini and Turner (2019), “Gainfully Employed? Assessing the Employment and Earnings of For-Profit College Students Using Administrative Data.” You can find the article here: <http://jhr.uwpress.org/content/54/2/342.abstract>. (37 points)

- (a) Cellini and Turner use a generalized difference-in-differences regression model to estimate the causal effect of attending a for-profit certificate program on labor market outcomes. What specific outcome variables do they examine, and what dataset(s) do they use? (4 points)

The main outcome variables include employment (0/1) and earnings (levels and logs). US DOE data identify all federally-aided students who exited a for-profit post-secondary institution or public community college certificate program between 2006 and 2008. Income and employment status are taken from tax data from the IRS (1999-2014).

- (b) How is the “treatment” variable defined here and what are the possible “pre” and “post” years? How many potential pre and post years are there? (4 points)

“Treatment” is attendance at a for-profit post-secondary institution. The potential “pre-treatment” years are 1999-2007, depending on when students started and exited their program. The potential “post” years are 2007-2014, again depending on when students left their program. Thus, there are approximately 6 pre-treatment years and 5-6 post-treatment years available.

- (c) The authors use three different groups of “untreated” individuals as comparison groups. What were they, and what was their rationale for looking at each? Which comparison group is their “preferred” one, and why? (4 points)

Their comparison groups include: (1) public community college students; (2) public community college students matched by demographics, prior earnings, field of study, geography, and age group; and (3) a matched sample of individuals with no post-secondary education. The first two comparison groups are used to estimate the effect of attending a for-profit institution relative to a public institution. The second is preferred by the authors since it accounts for differences in the composition of these two populations (for-profit and public). The third comparison group is used to estimate the

effect of attending a for-profit institution relative to no college. One challenge with the “no college” comparison group is the lack of a defined pre- and post- period. Unlike the community college comparison group, the no college group also cannot be matched based on, say, field of study.

- (d) Equation (1) on page 350 shows their regression specification. Carefully explain what each term represents, and how the causal effect of attending a for-profit certificate program is being identified. Why is there not a main effect for “For-Profit” in the model? (5 points)

$$y_{it} = \alpha_0 + \alpha_1(Post_{it}) + \alpha_2(Post_{it} * ForProfit_i) + d_t + d_a + d_i + \epsilon_{it}$$

- $Post_{it} = 1$ in all years following exit from the post-secondary program
- $ForProfit_i = 1$ for individuals i that attended a for-profit program
- d_t are year effects to capture mean differences in the outcome due to macroeconomic conditions
- d_a are age fixed effects to capture mean differences in the outcome due to, say, work experience
- d_i are individual fixed effects
- α_1 is the “first difference”: the mean pre-to-post change in the outcome for individuals who attended public certificate programs
- α_2 is the “second difference” (or DD): the differential pre-to-post change in the outcome for individuals who attended a for-profit program

There are individual fixed effects in this regression, which means coefficient estimates are identified using *within-person* changes over time. There is no $ForProfit_i$ main effect since it is collinear with the individual effect. (It does not vary over time, but rather just indicates whether or not the student ultimately enrolled in a for-profit institution).

- (e) Carefully explain the main assumption necessary to interpret the difference-in-differences estimate here as a causal effect. What evidence do the authors provide that this assumption holds for their three different comparison groups? (5 points)

The assumption is that the pre-to-post change in the outcome for the comparison group (e.g., public college attendees) represents what would have occurred for the treatment group (for-profit attendees), had they not been treated. Figure 1 displays the trend in employment and earnings for each group, prior to their enrollment in a post-secondary program. While there are differences in the levels of earnings and employment, the time trends look very similar. This is particularly true for the matched sample. This provides some confidence that the trends would have remained the same in the absence of the treatment.

- (f) The paper's main results are reported in Table 3. Carefully interpret the coefficients reported in Panel B. What additional evidence does Figure 2 provide? **(10 points)**

Panel B of Table 3 reports the estimated pre-post change for the matched public sample, and the DD. For individuals who enrolled in public community college programs, annual earnings increased by \$1,069, on average, in years after exit from the program. For individuals in for-profit programs, this change was \$2,144 *lower*. Taken together, the annual earnings of the treatment group *declined* by an average of \$1,075.

The log earnings column excludes individuals with zero earnings, and thus should be interpreted as conditional on working. For individuals in public community college programs, annual earnings increased by about 16.8%. For individuals in for-profit programs, this change was 11.3 percentage points *lower*. Taken together, their annual earnings—conditional on working—increased by 5.5%.

The first column shows the effect on employment. For individuals in public programs, there was no significant change in the probability of employment. However, for individuals in for-profit programs, the probability of employment *declined* by 1.5 percentage points after exiting their program.

Figure 2 is an event study—it shows the differential effect of attending a for-profit program separately for each year after exiting the program.

- (g) Finally, Figure 4 shows the distribution of earnings effects *by school* for public and for-profit institutions. Cellini and Turner describe these as the result of “single-difference” regressions. Briefly explain what they mean by this, and why these should not be interpreted as the causal effects of attending specific institutions. **(5 points)**

It would be difficult to estimate a separate difference-in-differences model for each school since it is not obvious who the comparison group should be. (I.e., who are the students exiting public programs that might have attended *that specific for-profit program*?) Instead, Cellini & Turner estimate mean within-person, pre-post changes in earnings for each for-profit institution. These are single differences because they represent only the mean pre-post change of one group. As with any single difference, they should not be interpreted as causal, as it is difficult to separate the treatment effect from any change in the outcome over time that might have occurred in the absence of the treatment.

```

.
. // *****
. // LP0-8852 Problem set 4 solutions
. // Last updated: October 15, 2023
. // *****
.
. // ****
. // (a)
. // ****
. // Get data
. use https://github.com/spcorcor18/LP0-8852/raw/main/data/NYCbkfastlunch.dta, clear
. summ bkfast_part lunch_part

```

Variable	Obs	Mean	Std. Dev.	Min	Max
bkfast_part	8,061	.2594672	.1446061	.0054945	.9759036
lunch_part	7,790	.7767745	.1836831	.0122249	1

```

.
.
. // ****
. // (b)
. // ****
. // Set panel
. xtset schoolid year
      panel variable:  schoolid (unbalanced)
      time variable:  year, 2005 to 2012, but with gaps
                  delta:  1 unit
. xtdescribe
schoolid:  1, 2, ..., 1179                n =      1134
      year: 2005, 2006, ..., 2012          T =        8
      Delta(year) = 1 unit
      Span(year)  = 8 periods
      (schoolid*year uniquely identifies each observation)
Distribution of T_i:  min      5%      25%      50%      75%      95%      max
                   1         2         8         8         8         8         8
      Freq.  Percent  Cum. | Pattern
-----+-----
      908    80.07   80.07 | 11111111
       66     5.82   85.89 | .....11
       31     2.73   88.62 | .....111
       29     2.56   91.18 | ....1111
       17     1.50   92.68 | .1111111
       16     1.41   94.09 | ...11111
       14     1.23   95.33 | .....1
       10     0.88   96.21 | ..111111
        9     0.79   97.00 | 1111....
       34     3.00  100.00 | (other patterns)
-----+-----
      1134   100.00      | XXXXXXXX
.
.
. // ****
. // (c)
. // ****
. // Simple DD for limited sample (those who adopt BIC in 2010, or not at all)

```



```

. tabulate year bic2010
      | =1 if school adopted
      |      BIC in 2010
year |      0      1 |      Total
-----+-----+-----
2005 |      915      30 |      945
2006 |      934      30 |      964
2007 |      938      30 |      968
2008 |      949      30 |      979
2009 |      971      30 |     1,001
2010 |      995      33 |     1,028
2011 |     1,057      33 |     1,090
2012 |     1,061      33 |     1,094
-----+-----+-----
Total |     7,820     249 |     8,069
. gen byte ansample=0
. replace ansample=1 if bic2010==1 | bicever==0
(6,167 real changes made)

```

```

. gen      post2010=(year>=2010 & year~=. )
.

```

```

. _eststo bk1: reg bkfast_part i.bic2010##i.post2010 if ansample

```

Source	SS	df	MS	Number of obs	=	6,160
				F(3, 6156)	=	122.75
Model	6.66627777	3	2.22209259	Prob > F	=	0.0000
Residual	111.439598	6,156	.018102599	R-squared	=	0.0564
				Adj R-squared	=	0.0560
Total	118.105875	6,159	.019176145	Root MSE	=	.13455

bkfast_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
1.bic2010	.0364431	.011215	3.25	0.001	.0144578 .0584285
1.post2010	.0004512	.0035743	0.13	0.900	-.0065557 .0074581
bic2010#					
post2010					
1 1	.2219777	.0177852	12.48	0.000	.1871125 .256843
_cons	.2494476	.0022566	110.54	0.000	.2450239 .2538713

```

. _eststo lu1: reg lunch_part i.bic2010##i.post2010 if ansample
      Source |      SS      df      MS      Number of obs      =      5,971
-----+-----+-----+-----+-----+-----+-----+-----
      Model | 1.27574115      3      .425247049      Prob > F      =      0.0000
      Residual | 208.309617    5,967      .034910276      R-squared      =      0.0061
-----+-----+-----+-----+-----+-----+-----
      Total | 209.585358    5,970      .035106425      Adj R-squared   =      0.0056
                                         Root MSE      =      .18684

      lunch_part |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----+-----+-----+-----+-----+-----
      1.bic2010 |   .0698994   .0163374      4.28   0.000     .0378722     .1019265
      1.post2010 |  -.0118983   .0050251     -2.37   0.018    -.0217493    -.0020474
      |
      bic2010# |
      post2010 |
      1 1 |  -.0012284   .0254085     -0.05   0.961    -.0510383     .0485815
      |
      _cons |   .7724005   .0031963    241.65   0.000     .7661345     .7786665
-----+-----+-----+-----+-----+-----+-----

.
.
. // ****
. // (d)
. // ****
. // Descriptive statistics for BIC 2010 adopters and those who never adopt BIC
. sum totalenrollment- pctfemale free1 redu1 if ansample & bic2010==0, sep(0)
      Variable |      Obs      Mean      Std. Dev.      Min      Max
-----+-----+-----+-----+-----+-----+-----
totalenrol~t |      5,918    659.1048    338.0388           1    2324
      pctell |      5,917    13.08352    11.82031           0     98.8
      pctsped |      5,918    15.01414     6.168555           0    100
      pctasian |      5,918    13.47043    18.23617           0     93.3
      pctblack |      5,918     31.8549    29.64572           0    100
      pcthispan |      5,918    38.16107    25.82034           0    100
      pctwhite |      5,918    15.56301    21.71753           0    100
      pctfemale |      5,918     49.2623     5.328382           0    100
      free1 |      5,916    68.71993     23.0606    3.787879    100
      redu1 |      5,916    9.868489     5.385444           0    75.33414
. sum totalenrollment- pctfemale free1 redu1 if ansample & bic2010==1, sep(0)
      Variable |      Obs      Mean      Std. Dev.      Min      Max
-----+-----+-----+-----+-----+-----+-----
totalenrol~t |      249    639.4659    269.285           155    1344
      pctell |      249    14.66145    10.83286            .5     49
      pctsped |      249    17.23976     6.466239           5.7    38.3
      pctasian |      249     3.01245     5.150388           0    24.5
      pctblack |      249    45.78554    28.32688           1.5    96.4
      pcthispan |      249    45.8494    26.93749           2.6    92.1
      pctwhite |      249     4.431727    11.69414           0    68.8
      pctfemale |      249    48.77711     2.737346           41    55.7
      free1 |      249    83.92061    12.21668    33.04158    100
      redu1 |      249     7.111174     3.788053           0    15.5102

.
.
. // ****
. // (e)
. // ****
. // Simple DD with covariates
. global covars "pctell pctsped totalenrollment pctasian pctblack pcthispan"

```

```
. global covars "$covars pctfemale free1 redu1"
```

```
. _eststo bk2: reg bkfast_part i.bic2010##i.post2010 $covars if ansample
```

Source	SS	df	MS	Number of obs	=	6,159
				F(12, 6146)	=	180.70
Model	30.8011322	12	2.56676102	Prob > F	=	0.0000
Residual	87.3017665	6,146	.014204648	R-squared	=	0.2608
				Adj R-squared	=	0.2594
Total	118.102899	6,158	.019178775	Root MSE	=	.11918

bkfast_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
1.bic2010	.0090898	.0100252	0.91	0.365	-.0105631	.0287428
1.post2010	-.0061984	.0032369	-1.91	0.056	-.012544	.0001471
bic2010# post2010						
1 1	.2192397	.0157598	13.91	0.000	.1883451	.2501344
pctell	.0009818	.0001984	4.95	0.000	.0005929	.0013707
pctsped	.0008707	.000289	3.01	0.003	.0003041	.0014373
totalenroll~t	-.0001309	4.92e-06	-26.63	0.000	-.0001405	-.0001213
pctasian	-.0004099	.0001441	-2.84	0.004	-.0006923	-.0001274
pctblack	-.0001128	.0001124	-1.00	0.316	-.0003332	.0001076
pcthispanic	-.0008151	.0001285	-6.35	0.000	-.0010669	-.0005633
pctfemale	-.0018614	.0003124	-5.96	0.000	-.0024739	-.0012489
free1	.0019951	.00012	16.63	0.000	.0017598	.0022303
redu1	.0019409	.0003249	5.97	0.000	.001304	.0025778
_cons	.2881719	.0194463	14.82	0.000	.2500504	.3262935

```
. margins bic2010#post2010
```

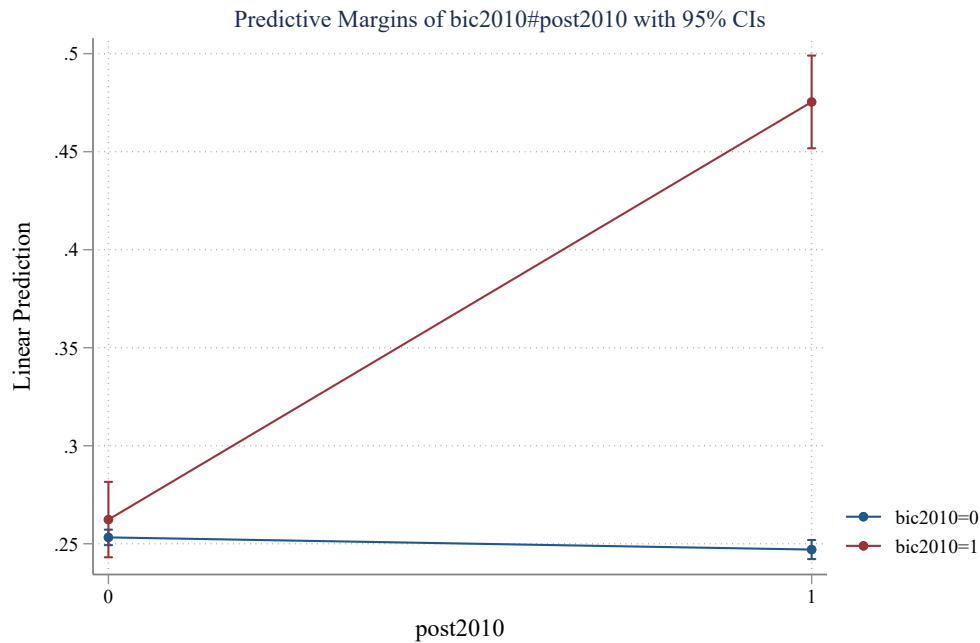
```
Predictive margins                                Number of obs    =      6,159
Model VCE      : OLS
Expression     : Linear prediction, predict()
```

		Delta-method				
		Margin	Std. Err.	t	P> t	[95% Conf. Interval]
bic2010# post2010						
0 0		.2532383	.0020199	125.37	0.000	.2492785 .2571981
0 1		.2470399	.0024864	99.36	0.000	.2421657 .2519141
1 0		.2623282	.0098097	26.74	0.000	.2430977 .2815586
1 1		.4753695	.0120615	39.41	0.000	.4517247 .4990143

```
. marginsplot, xdim(post2010) name(parte,replace)
```

```
Variables that uniquely identify margins: bic2010 post2010
```

```
. graph export parte.pdf, name(parte) as(pdf) replace
(file parte.pdf written in PDF format)
```



```
.
. _eststo lu2: reg lunch_part i.bic2010##i.post2010 $covars if ansample
      Source |         SS          df           MS       Number of obs   =       5,970
-----+-----+-----+-----+-----+-----+-----+-----
      Model |    102.139697         12     8.51164141    F(12, 5957)       =    471.98
      Residual |    107.427693       5,957     .018033858    Prob > F           =     0.0000
-----+-----+-----+-----+-----+-----+-----
      Total |    209.56739       5,969     .035109296    R-squared          =     0.4874
                                           Adj R-squared      =     0.4864
                                           Root MSE          =     .13429

      lunch_part |         Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----+-----+-----+-----+-----+-----
      1.bic2010 |      .000049   .0118444      0.00   0.997    - .0231703   .0232682
      1.post2010 |     -.0132425   .0036987     -3.58   0.000    - .0204932  -.0059918
      |
      bic2010# |
      post2010 |
      1 1 |      .0055167   .0182669      0.30   0.763    - .030293   .0413265
      |
      pctell |      .0020897   .0002269      9.21   0.000      .0016449   .0025345
      pctsped |     -.0001192   .0003317     -0.36   0.719    - .0007696   .0005311
totalenroll~t |     -.0000249   5.59e-06     -4.45   0.000    - .0000358  -.0000139
      pctasian |      .0010351   .0001629      6.35   0.000      .0007157   .0013546
      pctblack |      .0004639   .0001276      3.64   0.000      .0002137   .000714
      pcthispan |      .0004775   .0001461      3.27   0.001      .0001911   .000764
      pctfemale |     -.0029157   .000354     -8.24   0.000    - .0036097  -.0022217
      free1 |      .0050856   .0001371     37.10   0.000      .004817   .0053543
      redu1 |      .0056645   .0003697     15.32   0.000      .0049398   .0063893
      _cons |      .457841   .0220444     20.77   0.000      .414626   .501056
-----+-----+-----+-----+-----+-----+-----
.
.
. // ****
. // (f)
. // ****
. // Simple DD with linear time trend
```

```

. gen time=year-2010
. label var time "linear time trend (0 = 2010)"
.
. _eststo bk3: reg bkfast_part i.bic2010##i.post2010 time if ansample

```

Source	SS	df	MS	Number of obs	=	6,160
Model	7.10607017	4	1.77651754	F(4, 6155)	=	98.51
Residual	110.999805	6,155	.018034087	Prob > F	=	0.0000
				R-squared	=	0.0602
				Adj R-squared	=	0.0596
Total	118.105875	6,159	.019176145	Root MSE	=	.13429

bkfast_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
1.bic2010	.0366001	.0111938	3.27	0.001	.0146563 .0585438
1.post2010	-.0274635	.0066844	-4.11	0.000	-.0405672 -.0143599
bic2010# post2010					
1 1	.2219954	.0177515	12.51	0.000	.1871962 .2567947
time	.0069743	.0014123	4.94	0.000	.0042057 .0097428
_cons	.2702134	.0047703	56.65	0.000	.260862 .2795648


```

. _eststo lu3: reg lunch_part i.bic2010##i.post2010 time if ansample

```

Source	SS	df	MS	Number of obs	=	5,971
Model	1.29011709	4	.322529273	F(4, 5966)	=	9.24
Residual	208.295241	5,966	.034913718	Prob > F	=	0.0000
				R-squared	=	0.0062
				Adj R-squared	=	0.0055
Total	209.585358	5,970	.035106425	Root MSE	=	.18685

lunch_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
1.bic2010	.0699698	.0163385	4.28	0.000	.0379403 .1019992
1.post2010	-.0170725	.0095012	-1.80	0.072	-.0356983 .0015533
bic2010# post2010					
1 1	-.0012979	.02541	-0.05	0.959	-.0511107 .0485149
time	.0012876	.0020067	0.64	0.521	-.0026462 .0052214
_cons	.7762593	.0068103	113.98	0.000	.7629086 .78961

```
. _eststo bk4: reg bkfast_part i.bic2010##i.post2010 $covars time if ansample
```

Source	SS	df	MS	Number of obs	=	6,159
				F(13, 6145)	=	169.08
Model	31.1152371	13	2.39347978	Prob > F	=	0.0000
Residual	86.9876616	6,145	.014155844	R-squared	=	0.2635
				Adj R-squared	=	0.2619
Total	118.102899	6,158	.019178775	Root MSE	=	.11898

bkfast_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
1.bic2010	.0092302	.010008	0.92	0.356	-.010389	.0288494
1.post2010	-.0296849	.0059415	-5.00	0.000	-.0413323	-.0180375
bic2010#						
post2010						
1 1	.2193495	.0157327	13.94	0.000	.1885079	.2501911
pctell	.0009559	.0001981	4.82	0.000	.0005675	.0013443
pctsped	.0007479	.0002897	2.58	0.010	.00018	.0013159
totalenroll~t	-.0001299	4.91e-06	-26.44	0.000	-.0001395	-.0001202
pctasian	-.0004453	.000144	-3.09	0.002	-.0007276	-.0001629
pctblack	-.0001327	.0001123	-1.18	0.237	-.0003529	.0000874
pcthispanic	-.0008354	.0001283	-6.51	0.000	-.0010869	-.0005839
pctfemale	-.0018919	.000312	-6.06	0.000	-.0025035	-.0012804
free1	.0020306	.00012	16.92	0.000	.0017953	.0022659
redu1	.0020122	.0003247	6.20	0.000	.0013758	.0026487
time	.0059491	.0012629	4.71	0.000	.0034733	.0084249
_cons	.3075019	.0198418	15.50	0.000	.2686049	.3463988

```

. _eststo lu4: reg lunch_part i.bic2010##i.post2010 $covars time if ansample
      Source |           SS           df           MS       Number of obs   =        5,970
-----+-----+-----+-----+-----+-----+-----+-----
      Model |    102.378673          13     7.87528254       Prob > F           =        0.0000
      Residual |    107.188716        5,956     .017996762       R-squared           =        0.4885
-----+-----+-----+-----+-----+-----+-----
      Total |    209.56739         5,969     .035109296       Adj R-squared       =        0.4874
                                         Root MSE           =        .13415
-----+-----+-----+-----+-----+-----+-----
      lunch_part |           Coef.      Std. Err.      t    P>|t|     [95% Conf. Interval]
-----+-----+-----+-----+-----+-----+-----
      1.bic2010 |      .0003089      .0118324      0.03   0.979     -.0228869     .0235047
      1.post2010 |     -.0342506      .0068475     -5.00   0.000     -.0476741     -.020827
      |
      bic2010# |
      post2010 |
      1 1 |      .0053054      .0182482      0.29   0.771     -.0304677     .0410785
      |
      pctell |      .0020656      .0002268      9.11   0.000      .0016211     .0025101
      pctsped |     -.0002263      .0003327     -0.68   0.496     -.0008785     .0004259
totalenroll~t |     -.0000241     5.59e-06     -4.30   0.000     -.0000035     -.0000131
      pctasian |      .0010026      .000163      6.15   0.000      .000683     .0013222
      pctblack |      .0004451      .0001276      3.49   0.000      .000195     .0006951
      pcthisp |      .0004586      .0001461      3.14   0.002      .0001722     .0007449
      pctfemale |     -.0029416      .0003537     -8.32   0.000     -.003635     -.0022481
      free1 |      .0051204      .0001373     37.31   0.000      .0048513     .0053895
      redu1 |      .0057274      .0003697     15.49   0.000      .0050026     .0064522
      time |      .0052989      .0014541      3.64   0.000      .0024482     .0081495
      _cons |      .4750103      .0225201     21.09   0.000      .4308627     .5191579
-----+-----+-----+-----+-----+-----+-----
.
.
. // ****
. // (g)
. // ****
. // Simple DD with year effects

```

```
. _eststo bk5: reg bkfast_part i.bic2010##i.post2010 i.year if ansample
note: 2012.year omitted because of collinearity
```

Source	SS	df	MS	Number of obs	=	6,160
				F(9, 6150)	=	46.07
Model	7.45976317	9	.828862574	Prob > F	=	0.0000
Residual	110.646112	6,150	.017991238	R-squared	=	0.0632
				Adj R-squared	=	0.0618
Total	118.105875	6,159	.019176145	Root MSE	=	.13413

bkfast_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
1.bic2010	.036649	.0111805	3.28	0.001	.0147313	.0585667
1.post2010	.013186	.0068367	1.93	0.054	-.0002162	.0265883
bic2010#						
post2010						
1 1	.221605	.0177307	12.50	0.000	.1868466	.2563634
year						
2006	.0016656	.0070186	0.24	0.812	-.0120932	.0154245
2007	.0129012	.0070115	1.84	0.066	-.0008438	.0266462
2008	.0302031	.0069998	4.31	0.000	.016481	.0439252
2009	.0337616	.0069611	4.85	0.000	.0201153	.0474079
2010	.0103849	.0066675	1.56	0.119	-.0026858	.0234556
2011	-.0003521	.0065567	-0.05	0.957	-.0132056	.0125013
2012	0	(omitted)				
_cons	.2335355	.005003	46.68	0.000	.2237279	.243343


```
. _eststo lu5: reg lunch_part i.bic2010##i.post2010 i.year if ansample
note: 2012.year omitted because of collinearity
```

Source	SS	df	MS	Number of obs	=	5,971
-----+-----						
Model	1.66017991	9	.184464435	F(9, 5961)	=	5.29
Residual	207.925179	5,961	.034880922	Prob > F	=	0.0000
-----+-----						
Total	209.585358	5,970	.035106425	R-squared	=	0.0079
				Adj R-squared	=	0.0064
				Root MSE	=	.18676

lunch_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
1.bic2010	.0700814	.0163311	4.29	0.000	.0380665	.1020963
1.post2010	-.0131431	.0096473	-1.36	0.173	-.0320552	.005769
bic2010#						
post2010						
1 1	-.0014192	.0253983	-0.06	0.955	-.051209	.0483706
year						
2006	.0061342	.0099098	0.62	0.536	-.0132927	.0255611
2007	.0130161	.0099166	1.31	0.189	-.0064241	.0324563
2008	.0177306	.0099723	1.78	0.075	-.0018188	.03728
2009	.0157621	.0099376	1.59	0.113	-.0037192	.0352433
2010	.0241326	.009349	2.58	0.010	.0058052	.0424601
2011	.0120087	.0092097	1.30	0.192	-.0060456	.030063
2012	0	(omitted)				
cons	.7618583	.0070841	107.54	0.000	.7479709	.7757457

.

```
. _eststo bk6: reg bkfast_part i.bic2010##i.post2010 $covars i.year if ansample
note: 2012.year omitted because of collinearity
```

Source	SS	df	MS	Number of obs	=	6,159
Model	31.4223181	18	1.74568434	F(18, 6140)	=	123.66
Residual	86.6805806	6,140	.014117358	Prob > F	=	0.0000
				R-squared	=	0.2661
				Adj R-squared	=	0.2639
Total	118.102899	6,158	.019178775	Root MSE	=	.11882

bkfast_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
1.bic2010	.0092247	.0099945	0.92	0.356	-.0103679	.0288174
1.post2010	.0046158	.0061274	0.75	0.451	-.007396	.0166276
bic2010#						
post2010						
1 1	.2191936	.0157114	13.95	0.000	.1883938	.2499934
pctell	.0008866	.0001989	4.46	0.000	.0004967	.0012764
pctsped	.0005844	.0002916	2.00	0.045	.0000128	.001156
totalenroll~t	-.0001301	4.91e-06	-26.51	0.000	-.0001397	-.0001205
pctasian	-.0004491	.0001439	-3.12	0.002	-.0007311	-.0001671
pctblack	-.0001452	.0001122	-1.29	0.196	-.0003652	.0000748
pcthispanic	-.0008295	.0001281	-6.47	0.000	-.0010807	-.0005783
pctfemale	-.0019468	.0003118	-6.24	0.000	-.002558	-.0013356
free1	.002053	.00012	17.10	0.000	.0018177	.0022884
redu1	.0019546	.0003248	6.02	0.000	.001318	.0025913
year						
2006	.0002767	.0062238	0.04	0.965	-.0119242	.0124777
2007	.0100518	.0062234	1.62	0.106	-.0021483	.0222519
2008	.0253551	.0062545	4.05	0.000	.0130941	.037616
2009	.0296896	.0062229	4.77	0.000	.0174905	.0418887
2010	.0105032	.0059306	1.77	0.077	-.0011229	.0221294
2011	-.0013092	.0058115	-0.23	0.822	-.0127017	.0100834
2012	0	(omitted)				
_cons	.2819381	.0197941	14.24	0.000	.2431347	.3207415

```
. _eststo lu6: reg lunch_part i.bic2010##i.post2010 $covars i.year if ansample
note: 2012.year omitted because of collinearity
```

Source	SS	df	MS	Number of obs	=	5,970
Model	102.890378	18	5.71613213	F(18, 5951)	=	318.88
Residual	106.677011	5,951	.017925897	Prob > F	=	0.0000
				R-squared	=	0.4910
				Adj R-squared	=	0.4894
Total	209.56739	5,969	.035109296	Root MSE	=	.13389

lunch_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
1.bic2010	.0003312	.0118093	0.03	0.978	-.0228194	.0234817
1.post2010	-.0029389	.007001	-0.42	0.675	-.0166634	.0107856
bic2010#						
post2010						
1 1	.0053633	.0182124	0.29	0.768	-.0303395	.0410662
pctell	.0019851	.0002275	8.73	0.000	.0015391	.002431
pctsped	-.0004065	.0003345	-1.22	0.224	-.0010622	.0002492
totalenroll~t	-.000024	5.58e-06	-4.30	0.000	-.0000349	-.000013
pctasian	.0009978	.0001627	6.13	0.000	.0006788	.0013168
pctblack	.000428	.0001274	3.36	0.001	.0001782	.0006777
pcthispanic	.0004604	.0001458	3.16	0.002	.0001746	.0007462
pctfemale	-.0029913	.0003533	-8.47	0.000	-.0036839	-.0022987
free1	.0051531	.0001372	37.56	0.000	.0048841	.005422
redu1	.0056432	.0003696	15.27	0.000	.0049186	.0063679
year						
2006	.0124052	.0071109	1.74	0.081	-.0015347	.0263452
2007	.0230456	.0071232	3.24	0.001	.0090816	.0370095
2008	.0307087	.0072128	4.26	0.000	.016569	.0448484
2009	.0359396	.0071874	5.00	0.000	.0218497	.0500295
2010	.0213247	.006728	3.17	0.002	.0081355	.0345139
2011	.0110212	.0066061	1.67	0.095	-.0019292	.0239717
2012	0	(omitted)				
_cons	.4439037	.0224522	19.77	0.000	.3998892	.4879182

```
.
.
. // ****
. // (h)
. // ****
. // Two-way fixed effects model
```

```
. _eststo bk7: xtreg bkfast_part i.bic2010##i.post2010 i.year $covars if ansample, fe
note: 1.bic2010 omitted because of collinearity
note: 2012.year omitted because of collinearity
Fixed-effects (within) regression               Number of obs   =       6,159
Group variable: schoolid                       Number of groups =       877
R-sq:                                           Obs per group:
    within = 0.2282                             min =          1
    between = 0.1835                             avg =         7.0
    overall = 0.2257                             max =          8
                                           F(17,5265)      =      91.56
corr(u_i, Xb) = 0.1285                       Prob > F        =      0.0000
```

bkfast_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
1.bic2010	0 (omitted)					
1.post2010	.008418	.0032356	2.60	0.009	.0020748	.0147612
bic2010#						
post2010						
1 1	.2439241	.0076516	31.88	0.000	.2289237	.2589244
year						
2006	.0015795	.0029676	0.53	0.595	-.0042382	.0073972
2007	.0103671	.003006	3.45	0.001	.0044741	.0162602
2008	.027108	.0031138	8.71	0.000	.0210036	.0332123
2009	.0308461	.0031798	9.70	0.000	.0246124	.0370798
2010	.0103183	.0028919	3.57	0.000	.0046491	.0159876
2011	-.0000499	.0027699	-0.02	0.986	-.0054799	.0053802
2012	0 (omitted)					
pctell	.0003947	.0003068	1.29	0.198	-.0002068	.0009962
pctsped	-.000535	.0003514	-1.52	0.128	-.0012239	.000154
totalenroll~t	-.0001048	8.90e-06	-11.78	0.000	-.0001222	-.0000874
pctasian	.0003682	.0004336	0.85	0.396	-.0004818	.0012183
pctblack	.0003755	.0003397	1.11	0.269	-.0002905	.0010415
pcthispanic	.0000632	.0003393	0.19	0.852	-.000602	.0007283
pctfemale	-.0004462	.0003711	-1.20	0.229	-.0011738	.0002814
free1	.0005912	.0001113	5.31	0.000	.0003731	.0008093
redu1	.0008902	.0002559	3.48	0.001	.0003885	.0013919
_cons	.262379	.0327649	8.01	0.000	.1981461	.3266118
sigma_u	.1222614					
sigma_e	.05605524					
rho	.82630276	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(876, 5265) = 25.49                      Prob > F = 0.0000
```

```

. _eststo lu7: xtreg lunch_part i.bic2010##i.post2010 i.year $covars if ansample, fe
note: 1.bic2010 omitted because of collinearity
note: 2012.year omitted because of collinearity
Fixed-effects (within) regression              Number of obs   =       5,970
Group variable: schoolid                      Number of groups  =       876
R-sq:                                         Obs per group:
    within = 0.0985                          min =           1
    between = 0.2635                         avg =          6.8
    overall = 0.2706                         max =           8
                                           F(17,5077)       =       32.62
corr(u_i, Xb) = -0.0497                     Prob > F          =       0.0000

```

lunch_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
1.bic2010	0 (omitted)					
1.post2010	.0001747	.0037997	0.05	0.963	-.0072743	.0076237
bic2010#						
post2010						
1 1	.0033581	.0091823	0.37	0.715	-.0146431	.0213593
year						
2006	.0092449	.0034715	2.66	0.008	.0024391	.0160506
2007	.0181451	.0035263	5.15	0.000	.0112321	.0250582
2008	.0271614	.0036868	7.37	0.000	.0199337	.0343892
2009	.0312953	.0037637	8.32	0.000	.0239169	.0386737
2010	.0179463	.003362	5.34	0.000	.0113554	.0245371
2011	.0101406	.0032232	3.15	0.002	.0038218	.0164595
2012	0 (omitted)					
pctell	.0000564	.0003633	0.16	0.877	-.0006558	.0007685
pctsped	-.0005706	.0004137	-1.38	0.168	-.0013817	.0002405
totalenroll~t	-.0000618	.0000106	-5.83	0.000	-.0000825	-.000041
pctasian	.0035514	.0005024	7.07	0.000	.0025664	.0045363
pctblack	.0039734	.0003953	10.05	0.000	.0031983	.0047484
pcthispan	.0026529	.0003953	6.71	0.000	.001878	.0034278
pctfemale	-.0009508	.0004347	-2.19	0.029	-.001803	-.0000987
free1	.001319	.0001307	10.09	0.000	.0010628	.0015752
redu1	.0016603	.0002971	5.59	0.000	.0010778	.0022428
_cons	.4687328	.0381207	12.30	0.000	.3939998	.5434658
sigma_u	.152201					
sigma_e	.06461257					
rho	.84730084	(fraction of variance due to u_i)				

```

F test that all u_i=0: F(875, 5077) = 23.40                      Prob > F = 0.0000

```

```

.
.
. // ****
. // (i)
. // ****
. // Event study using xtreg and interaction of treatment and individual years

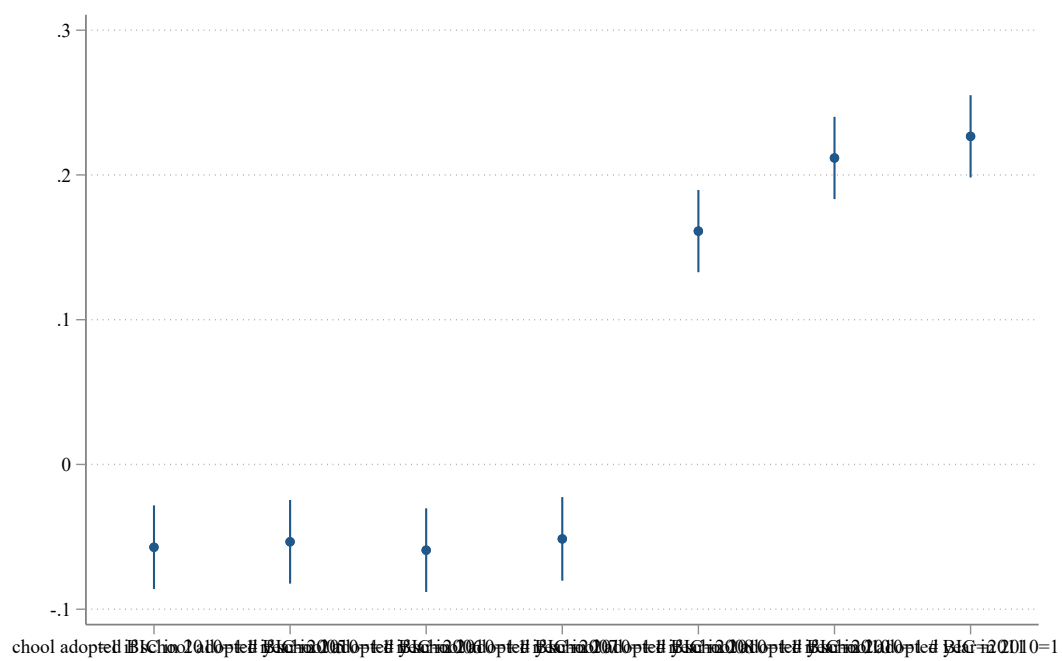
```

```
. _eststo bk8: xtreg bkfast_part i.bic2010##ib2009.year $covars if ansample, fe
note: 1.bic2010 omitted because of collinearity
```

```
Fixed-effects (within) regression      Number of obs   =      6,159
Group variable: schoolid               Number of groups =      877
R-sq:                                Obs per group:
    within = 0.2350                      min =          1
    between = 0.1827                     avg  =         7.0
    overall = 0.2220                      max  =          8
                                         F(23,5259)      =      70.23
corr(u_i, Xb) = 0.1470                   Prob > F        =      0.0000
```

bkfast_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
<hr/>						
1.bic2010	0 (omitted)					
year						
2005	-.028629	.0032228	-8.88	0.000	-.034947	-.022311
2006	-.0271434	.0031515	-8.61	0.000	-.0333216	-.0209651
2007	-.0181234	.0030588	-5.92	0.000	-.0241199	-.0121268
2008	-.0015876	.0030337	-0.52	0.601	-.0075349	.0043597
2010	-.0086379	.0029975	-2.88	0.004	-.0145143	-.0027616
2011	-.0211961	.0030009	-7.06	0.000	-.0270792	-.015313
2012	-.0217832	.0030143	-7.23	0.000	-.0276925	-.0158739
bic2010#year						
1 2005	-.057183	.0147454	-3.88	0.000	-.0860901	-.0282759
1 2006	-.0534223	.0147392	-3.62	0.000	-.0823173	-.0245273
1 2007	-.0591941	.0147344	-4.02	0.000	-.0880797	-.0303085
1 2008	-.0514263	.0147229	-3.49	0.000	-.0802894	-.0225632
1 2010	.1611984	.0144975	11.12	0.000	.1327772	.1896196
1 2011	.2117195	.0144941	14.61	0.000	.183305	.240134
1 2012	.2266655	.0145017	15.63	0.000	.1982361	.255095
pctell	.0003374	.0003059	1.10	0.270	-.0002623	.0009371
pctsped	-.000541	.0003501	-1.55	0.122	-.0012274	.0001454
totalenroll~t	-.0001041	8.86e-06	-11.74	0.000	-.0001215	-.0000867
pctasian	.0004299	.0004323	0.99	0.320	-.0004176	.0012773
pctblack	.0004062	.0003385	1.20	0.230	-.0002574	.0010698
pcthispanic	.0000654	.000338	0.19	0.847	-.0005973	.000728
pctfemale	-.0003973	.0003702	-1.07	0.283	-.0011231	.0003285
free1	.0005935	.0001109	5.35	0.000	.0003762	.0008109
redu1	.0008633	.000255	3.39	0.001	.0003634	.0013632
_cons	.2894325	.0324408	8.92	0.000	.2258351	.35303
<hr/>						
sigma_u	.12273153					
sigma_e	.0558399					
rho	.82849824	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(876, 5259) = 25.71      Prob > F = 0.0000
. coefplot bk8, vertical keep(1.bic2010#*.year) name(parti)
. graph export parti.pdf, name(parti) as(pdf) replace
(file parti.pdf written in PDF format)
```



```

. _eststo lu8: xtreg lunch_part i.bic2010##ib2009.year $covars if ansample, fe
note: 1.bic2010 omitted because of collinearity
Fixed-effects (within) regression              Number of obs   =       5,970
Group variable: schoolid                      Number of groups  =       876
R-sq:                                         Obs per group:
    within = 0.0989                          min =           1
    between = 0.2636                         avg  =          6.8
    overall = 0.2707                         max  =           8
                                           F(23,5071)       =       24.20
corr(u_i, Xb) = -0.0505                     Prob > F          =       0.0000

```

lunch_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
<hr/>						
1.bic2010	0	(omitted)				
year						
2005	-.0310536	.0038248	-8.12	0.000	-.0385519	-.0235553
2006	-.0226167	.0037303	-6.06	0.000	-.0299296	-.0153038
2007	-.0134204	.0036269	-3.70	0.000	-.0205306	-.0063102
2008	-.0045999	.0036256	-1.27	0.205	-.0117076	.0025078
2010	-.0133993	.0035431	-3.78	0.000	-.0203452	-.0064533
2011	-.0209321	.0035575	-5.88	0.000	-.0279063	-.0139579
2012	-.0315923	.0035758	-8.84	0.000	-.0386024	-.0245822
bic2010#year						
1 2005	-.0054559	.0183161	-0.30	0.766	-.0413634	.0304516
1 2006	.015276	.0183039	0.83	0.404	-.0206075	.0511595
1 2007	.0076753	.0182209	0.42	0.674	-.0280456	.0433961
1 2008	.0126151	.0183868	0.69	0.493	-.023431	.0486612
1 2010	.0095776	.0179964	0.53	0.595	-.0257031	.0448584
1 2011	.0028193	.0178415	0.16	0.874	-.0321578	.0377964
1 2012	.0158268	.0177723	0.89	0.373	-.0190147	.0506683
pctell	.0000579	.0003637	0.16	0.874	-.0006551	.0007708
pctsped	-.0005642	.0004139	-1.36	0.173	-.0013756	.0002473
totalenroll~t	-.0000616	.0000106	-5.81	0.000	-.0000824	-.0000408
pctasian	.0035558	.0005029	7.07	0.000	.0025698	.0045417
pctblack	.003974	.0003955	10.05	0.000	.0031986	.0047495
pcthispanic	.0026485	.0003955	6.70	0.000	.0018732	.0034238
pctfemale	-.0009301	.0004355	-2.14	0.033	-.0017838	-.0000764
free1	.0013213	.0001308	10.10	0.000	.0010649	.0015777
redu1	.0016629	.0002973	5.59	0.000	.00108	.0022458
_cons	.4986455	.0379023	13.16	0.000	.4243406	.5729504
<hr/>						
sigma_u	.1521975					
sigma_e	.06463478					
rho	.84720593	(fraction of variance due to u_i)				

```

F test that all u_i=0: F(875, 5071) = 23.38                Prob > F = 0.0000

```

```

.
.
. // ****
. // (j)
. // ****
. // Event study using eventdd
. * ssc install eventdd
. * ssc install matsort

```



```

. gen timetoevent=year-2010 if bic2010==1
(7,820 missing values generated)
. eventdd bkfast_part $covars i.year if ansample, method(fe) timevar(timetoevent) ci(rcap)
Fixed-effects (within) regression              Number of obs   =       6159
Group variable: schoolid                      Number of groups =       877
R-sq:  within = 0.2350                        Obs per group:  min =        1
               between = 0.1827                  avg =       7.0
               overall = 0.2220                  max =        8
                                                F(23,5259)      =      70.23
corr(u_i, Xb) = 0.1470                        Prob > F         =      0.0000

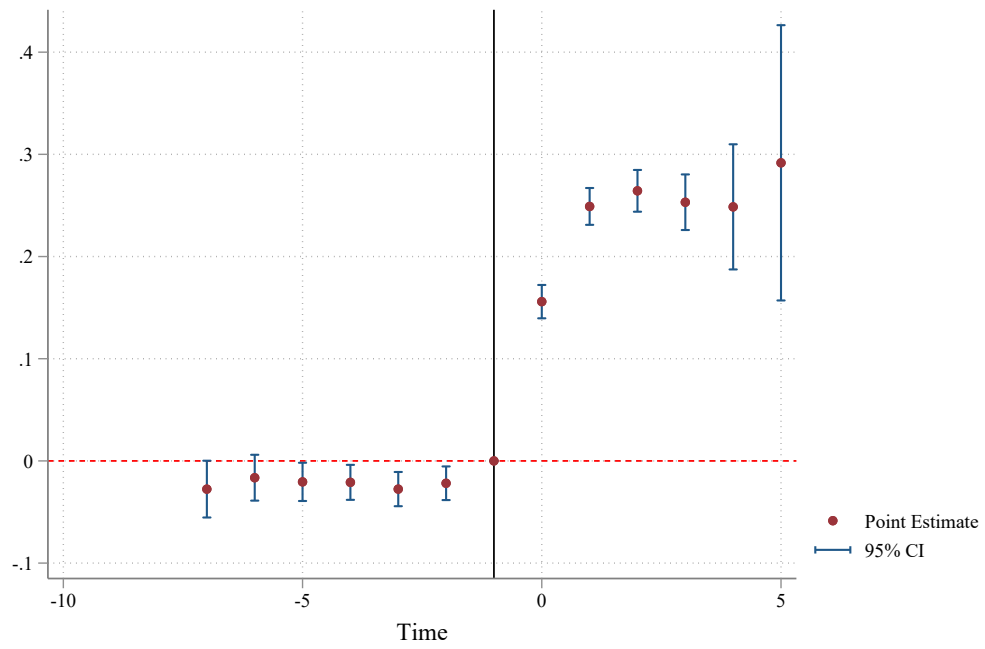
```

bkfast_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
pctell	.0003374	.0003059	1.10	0.270	-.0002623	.0009371
pctsped	-.000541	.0003501	-1.55	0.122	-.0012274	.0001454
totalenroll~t	-.0001041	8.86e-06	-11.74	0.000	-.0001215	-.0000867
pctasian	.0004299	.0004323	0.99	0.320	-.0004176	.0012773
pctblack	.0004062	.0003385	1.20	0.230	-.0002574	.0010698
pcthispanic	.0000654	.000338	0.19	0.847	-.0005973	.000728
pctfemale	-.0003973	.0003702	-1.07	0.283	-.0011231	.0003285
free1	.0005935	.0001109	5.35	0.000	.0003762	.0008109
redu1	.0008633	.000255	3.39	0.001	.0003634	.0013632
year						
2006	.0014856	.0030168	0.49	0.622	-.0044285	.0073997
2007	.0105056	.003054	3.44	0.001	.0045186	.0164926
2008	.0270414	.0031587	8.56	0.000	.0208491	.0332337
2009	.028629	.0032228	8.88	0.000	.022311	.034947
2010	.019991	.0032977	6.06	0.000	.0135261	.026456
2011	.0074329	.0032623	2.28	0.023	.0010375	.0138282
2012	.0068458	.0032615	2.10	0.036	.0004519	.0132397
lead5	-.057183	.0147454	-3.88	0.000	-.0860901	-.0282759
lead4	-.0534223	.0147392	-3.62	0.000	-.0823173	-.0245273
lead3	-.0591941	.0147344	-4.02	0.000	-.0880797	-.0303085
lead2	-.0514263	.0147229	-3.49	0.000	-.0802894	-.0225632
lag0	.1611984	.0144975	11.12	0.000	.1327772	.1896196
lag1	.2117195	.0144941	14.61	0.000	.183305	.240134
lag2	.2266655	.0145017	15.63	0.000	.1982361	.255095
_cons	.2608036	.0326621	7.98	0.000	.1967723	.3248349
sigma_u	.12273153					
sigma_e	.0558399					
rho	.82849824	(fraction of variance due to u_i)				

```

F test that all u_i=0: F(876, 5259) = 25.71                Prob > F = 0.0000
. graph export partj.pdf, replace as(pdf)
(file partj.pdf written in PDF format)

```



```
.
. // notice things look better if 2009 is treated as first year of treatment
. gen timetoevent2=year-2009 if bic2010==1
(7,820 missing values generated)
```

```
. eventdd bkfast_part $covars i.year if ansample, method(fe) timevar(timetoevent2) ci(rcap
> )
```

```
Fixed-effects (within) regression              Number of obs   =       6159
Group variable: schoolid                      Number of groups  =       877
R-sq:  within = 0.2350                        Obs per group: min =        1
        between = 0.1807                                avg =       7.0
        overall = 0.2247                                max =        8
                                                F(23,5259)       =      70.23
corr(u_i, Xb) = 0.1201                        Prob > F         =      0.0000
```

bkfast_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
pctell	.0003374	.0003059	1.10	0.270	-.0002623	.0009371
pctsped	-.000541	.0003501	-1.55	0.122	-.0012274	.0001454
totalenroll~t	-.0001041	8.86e-06	-11.74	0.000	-.0001215	-.0000867
pctasian	.0004299	.0004323	0.99	0.320	-.0004176	.0012773
pctblack	.0004062	.0003385	1.20	0.230	-.0002574	.0010698
pcthispan	.0000654	.000338	0.19	0.847	-.0005973	.000728
pctfemale	-.0003973	.0003702	-1.07	0.283	-.0011231	.0003285
free1	.0005935	.0001109	5.35	0.000	.0003762	.0008109
redu1	.0008633	.000255	3.39	0.001	.0003634	.0013632
year						
2006	.0014856	.0030168	0.49	0.622	-.0044285	.0073997
2007	.0105056	.003054	3.44	0.001	.0045186	.0164926
2008	.0270414	.0031587	8.56	0.000	.0208491	.0332337
2009	.028629	.0032228	8.88	0.000	.022311	.034947
2010	.019991	.0032977	6.06	0.000	.0135261	.026456
2011	.0074329	.0032623	2.28	0.023	.0010375	.0138282
2012	.0068458	.0032615	2.10	0.036	.0004519	.0132397
lead4	-.0057567	.0147362	-0.39	0.696	-.0346457	.0231323
lead3	-.001996	.0147344	-0.14	0.892	-.0308816	.0268896
lead2	-.0077678	.0147246	-0.53	0.598	-.0366342	.0210985
lag0	.0514263	.0147229	3.49	0.000	.0225632	.0802894
lag1	.2126247	.0145063	14.66	0.000	.1841862	.2410632
lag2	.2631458	.0145033	18.14	0.000	.2347133	.2915783
lag3	.2780918	.0145112	19.16	0.000	.2496439	.3065398
_cons	.2587245	.0326624	7.92	0.000	.1946926	.3227564
sigma_u	.12236383					
sigma_e	.0558399					
rho	.82764389	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(876, 5259) = 25.68                Prob > F = 0.0000
```

```
. drop timetoevent2
```

```
.
.
```

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

```
. // (k)
```

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

```
. // Two-way fixed effects model with full sample of schools (variable timing)
```

```

. tabulate year bicpost
    | =1 if post period for
    |   BIC school
  year |         0         1 |      Total
-----+-----+-----
    2005 |         945         0 |         945
    2006 |         964         0 |         964
    2007 |         967         1 |         968
    2008 |         974         5 |         979
    2009 |         971        30 |        1,001
    2010 |         965        63 |        1,028
    2011 |        1,003        87 |        1,090
    2012 |         995        99 |        1,094
-----+-----+-----
    Total |        7,784        285 |        8,069

. _eststo bk9: xtreg bkfast_part i.bicpost i.year, fe
Fixed-effects (within) regression              Number of obs   =        8,061
Group variable: schoolid                      Number of groups  =        1,134
R-sq:                                         Obs per group:
    within = 0.2795                               min =          1
    between = 0.0598                               avg  =         7.1
    overall = 0.1148                               max  =          8
                                         F(8,6919)         =       335.58
corr(u_i, Xb) = 0.0190                      Prob > F           =        0.0000
-----+-----+-----+-----+-----+-----+-----
bkfast_part |      Coef.   Std. Err.      t    P>|t|    [95% Conf. Interval]
-----+-----+-----+-----+-----+-----+-----
    1.bicpost |   .2401689    .00519     46.28  0.000    .2299949    .250343
    |
    year |
    2006 |   .0044188    .0029947     1.48  0.140   -.0014517    .0102893
    2007 |   .014081    .0029934     4.70  0.000    .008213    .0199489
    2008 |   .0323786    .00299     10.83  0.000    .0265173    .0382398
    2009 |   .0323863    .002985     10.85  0.000    .0265348    .0382379
    2010 |   .0288188    .0029883     9.64  0.000    .0229607    .0346768
    2011 |   .0212334    .0029844     7.11  0.000    .0153832    .0270837
    2012 |   .0238968    .0030003     7.96  0.000    .0180154    .0297783
    |
    _cons |   .2310583    .0021406    107.94  0.000    .226862    .2352546
-----+-----+-----+-----+-----+-----+-----
    sigma_u |   .13012765
    sigma_e |   .06530265
    rho |   .79882498   (fraction of variance due to u_i)
-----+-----+-----+-----+-----+-----+-----
F test that all u_i=0: F(1133, 6919) = 24.77                      Prob > F = 0.0000

```

```

. _eststo bk10: xtreg bkfast_part i.bicpost i.year $covars i.year, fe
Fixed-effects (within) regression      Number of obs   =      8,060
Group variable: schoolid               Number of groups =      1,133
R-sq:                                Obs per group:
    within = 0.3063                      min =          1
    between = 0.2030                     avg  =         7.1
    overall = 0.2492                      max  =          8
                                         F(17,6910)      =    179.44
corr(u_i, Xb) = 0.0725                   Prob > F        =    0.0000

```

bkfast_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
1.bicpost	.2350494	.0051218	45.89	0.000	.2250091	.2450896
year						
2006	.0017941	.0029722	0.60	0.546	-.0040323	.0076204
2007	.0097984	.0030065	3.26	0.001	.0039047	.0156921
2008	.0260502	.003113	8.37	0.000	.0199478	.0321525
2009	.0266835	.0031765	8.40	0.000	.0204566	.0329105
2010	.0227423	.0032784	6.94	0.000	.0163156	.0291689
2011	.0158046	.0032591	4.85	0.000	.0094157	.0221935
2012	.019164	.0032683	5.86	0.000	.0127572	.0255709
pctell	.000486	.0003003	1.62	0.106	-.0001027	.0010748
pctsped	-.0000381	.0003498	-0.11	0.913	-.0007239	.0006476
totalenroll~t	-.00011	8.92e-06	-12.34	0.000	-.0001275	-.0000926
pctasian	.0001814	.0004489	0.40	0.686	-.0006986	.0010614
pctblack	.0000463	.0003542	0.13	0.896	-.0006479	.0007406
pcthispanic	.0004305	.0003458	1.24	0.213	-.0002475	.0011084
pctfemale	-.0006497	.0003751	-1.73	0.083	-.001385	.0000856
free1	.0005287	.0001077	4.91	0.000	.0003177	.0007398
redu1	.0010268	.0002649	3.88	0.000	.0005075	.001546
_cons	.266862	.0336824	7.92	0.000	.2008342	.3328898
sigma_u	.12007859					
sigma_e	.0641221					
rho	.77811493	(fraction of variance due to u_i)				

```

F test that all u_i=0: F(1132, 6910) = 19.08      Prob > F = 0.0000

```

```

. _eststo lu9: xtreg lunch_part i.bicpost i.year, fe
Fixed-effects (within) regression      Number of obs   =       7,790
Group variable: schoolid              Number of groups =       1,133
R-sq:                                Obs per group:
    within = 0.0273                      min =          1
    between = 0.0002                     avg  =         6.9
    overall = 0.0024                     max  =          8
                                         F(8,6649)       =       23.34
corr(u_i, Xb) = -0.0090                 Prob > F        =       0.0000

```

lunch_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
1.bicpost	-.0009558	.00547	-0.17	0.861	-.0116787	.0097671
year						
2006	.0067058	.0031194	2.15	0.032	.0005909	.0128208
2007	.0156171	.0031225	5.00	0.000	.009496	.0217383
2008	.0241925	.0031449	7.69	0.000	.0180275	.0303574
2009	.0248664	.0031515	7.89	0.000	.0186883	.0310444
2010	.0109544	.0031018	3.53	0.000	.0048739	.0170348
2011	.0036836	.0031059	1.19	0.236	-.0024049	.0097721
2012	-.006695	.0031212	-2.14	0.032	-.0128136	-.0005764
_cons	.7672743	.0022401	342.52	0.000	.762883	.7716657
sigma_u	.17353188					
sigma_e	.06672362					
rho	.8711993	(fraction of variance due to u_i)				

```

F test that all u_i=0: F(1132, 6649) = 45.93      Prob > F = 0.0000

```

```

. _eststo lu10: xtreg lunch_part i.bicpost i.year $covars i.year, fe
Fixed-effects (within) regression      Number of obs   =       7,789
Group variable: schoolid               Number of groups =       1,132
R-sq:                                Obs per group:
    within = 0.0871                      min =         1
    between = 0.3086                     avg  =        6.9
    overall = 0.3043                     max  =         8
                                         F(17,6640)      =       37.29
corr(u_i, Xb) = 0.0393                   Prob > F        =       0.0000

```

lunch_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
1.bicpost	-.0029236	.0053289	-0.55	0.583	-.01337	.0075228
year						
2006	.0089807	.0030534	2.94	0.003	.002995	.0149663
2007	.0175242	.0030951	5.66	0.000	.0114569	.0235915
2008	.0263172	.0032315	8.14	0.000	.0199824	.032652
2009	.0290393	.0033019	8.79	0.000	.0225665	.035512
2010	.0167254	.003364	4.97	0.000	.0101309	.0233198
2011	.0087284	.0033533	2.60	0.009	.0021548	.015302
2012	-.0009017	.0033653	-0.27	0.789	-.0074989	.0056954
pctell	-.0000423	.0003112	-0.14	0.892	-.0006523	.0005677
pctsped	-.0007749	.0003613	-2.14	0.032	-.0014831	-.0000667
totalenroll~t	-.0000716	9.26e-06	-7.73	0.000	-.0000898	-.0000534
pctasian	.0035087	.0004558	7.70	0.000	.0026152	.0044023
pctblack	.0036064	.0003608	10.00	0.000	.0028992	.0043137
pcthispanic	.0029797	.0003534	8.43	0.000	.002287	.0036725
pctfemale	-.001066	.0003854	-2.77	0.006	-.0018215	-.0003105
free1	.0011112	.0001109	10.02	0.000	.0008939	.0013286
redu1	.0014702	.0002697	5.45	0.000	.0009415	.0019988
_cons	.505751	.034375	14.71	0.000	.438365	.573137
sigma_u	.14439164					
sigma_e	.06468285					
rho	.83286454	(fraction of variance due to u_i)				

```

F test that all u_i=0: F(1131, 6640) = 22.72      Prob > F = 0.0000

```

```

.
.
. // ****
. // (1)
. // ****
. // Event study using eventdd
. // first find year of BIC implementation
. egen temp=min(year) if bicpost==1, by(schoolid)
(7784 missing values generated)
. egen bicevent=max(temp), by(schoolid)
(7147 missing values generated)
. drop temp timetoevent
. // Create new time to event variable based on when school adopted BIC
. gen timetoevent=year-bicevent if bicever==1
(7,147 missing values generated)

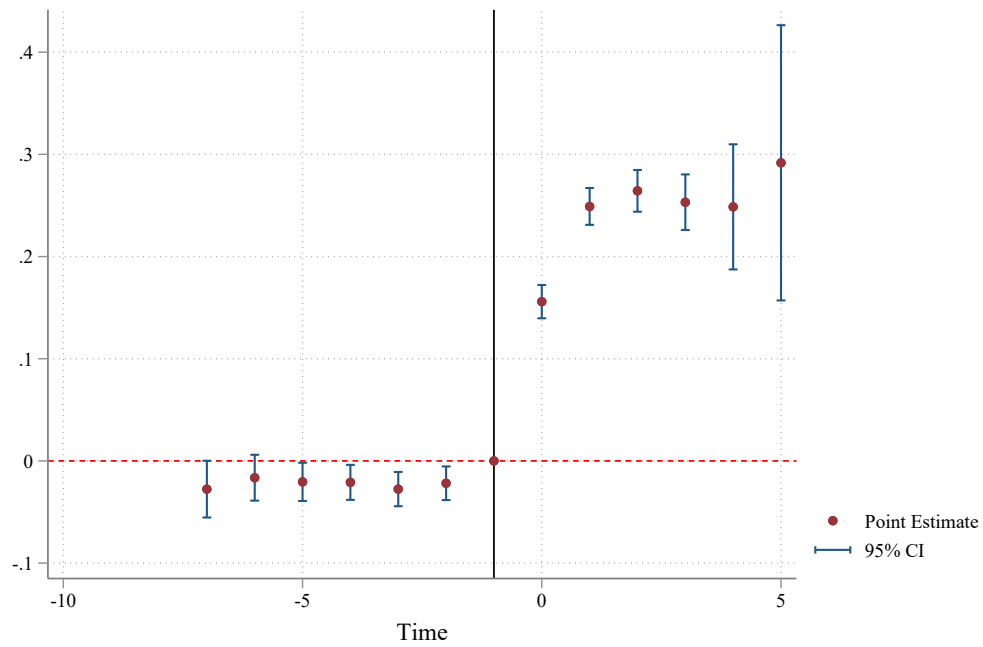
```

```
. _eststo bk11: eventdd bkfast_part $covars i.year, method(fe) timevar(timetoevent) ci(rca
> p)
```

```
Fixed-effects (within) regression               Number of obs   =       8060
Group variable: schoolid                       Number of groups =       1133
R-sq:  within = 0.3146                         Obs per group:  min =         1
              between = 0.2144                  avg =         7.1
              overall = 0.2593                  max =         8
                                              F(28,6899)      =    113.07
corr(u_i, Xb) = 0.1057                        Prob > F        =     0.0000
```

bkfast_part	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
pctell	.0003774	.0002991	1.26	0.207	-.0002088	.0009637
pctsped	-.0001068	.0003485	-0.31	0.759	-.00079	.0005763
totalenroll~t	-.0001052	8.89e-06	-11.84	0.000	-.0001226	-.0000878
pctasian	.0003149	.0004469	0.70	0.481	-.0005612	.0011911
pctblack	.000163	.0003525	0.46	0.644	-.0005279	.0008539
pcthispanic	.000336	.0003441	0.98	0.329	-.0003385	.0010105
pctfemale	-.0005987	.0003734	-1.60	0.109	-.0013306	.0001332
free1	.0005431	.0001072	5.06	0.000	.0003329	.0007533
redu1	.0009341	.0002637	3.54	0.000	.0004172	.001451
year						
2006	.0019782	.0029875	0.66	0.508	-.0038783	.0078347
2007	.0102962	.0030333	3.39	0.001	.0043499	.0162424
2008	.0265696	.003145	8.45	0.000	.0204045	.0327348
2009	.0280921	.003215	8.74	0.000	.0217897	.0343945
2010	.023918	.0033084	7.23	0.000	.0174326	.0304035
2011	.0139787	.0032913	4.25	0.000	.0075267	.0204306
2012	.0124126	.0033166	3.74	0.000	.0059109	.0189142
lead7	-.0276096	.0141737	-1.95	0.051	-.0553944	.0001753
lead6	-.0164351	.0114508	-1.44	0.151	-.0388821	.006012
lead5	-.0205187	.0095438	-2.15	0.032	-.0392274	-.0018099
lead4	-.0209752	.0087353	-2.40	0.016	-.038099	-.0038514
lead3	-.0275767	.0085468	-3.23	0.001	-.0443311	-.0108223
lead2	-.0218747	.0083968	-2.61	0.009	-.038335	-.0054145
lag0	.1558723	.008323	18.73	0.000	.1395567	.1721878
lag1	.2490285	.0091894	27.10	0.000	.2310145	.2670424
lag2	.2642903	.0104183	25.37	0.000	.2438673	.2847133
lag3	.2531332	.0138807	18.24	0.000	.2259227	.2803437
lag4	.2485886	.0312343	7.96	0.000	.1873598	.3098173
lag5	.2916986	.068707	4.25	0.000	.1570117	.4263855
_cons	.2637858	.0335307	7.87	0.000	.1980552	.3295163
sigma_u	.11963989					
sigma_e	.06378841					
rho	.77865225	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(1132, 6899) = 19.33                Prob > F = 0.0000
. graph export partj.pdf, replace as(pdf)
(file partj.pdf written in PDF format)
```

```
.
. esttab bk* using breakfast_results.csv, csv drop(0.*) replace
(output written to breakfast_results.csv)
. esttab lu* using lunch_results.csv, csv drop(0.*) replace
(output written to lunch_results.csv)
. capture log close
```