Econometrics assignment 5a

Joost Bouten, SNR: 1265889
Twan Vissers, SNR: 1266283
Fons Strik, SNR: 1257943

The commands and output of all questions can be found in the log-file included below. (Many lines and thus not compatible to include within some questions)

II.

a. We find that the mean of the main outcome variable is equal to 10.29

Command + output:

```
. sum calendar_week if LetterReceived==1
```

Variable	Obs	Mean	Std. Dev.	Min	Max
calendar_w~k	175	14.65714	8.259244	-5	28

```
. *Minimum is week -5, we are looking for the mean of the outcome variable before week -5
. sum residual_weight if calendar_week<-6
```

Variable	Obs	Mean	Std. Dev.	Min	Max
residual_w~t	579	10.28636	1.38393	5.1	14.8

b. We find there are 65 garbage routes (unique values).

Command + output:

```
. codebook route

-------------------------------------------------------------------------------
route                                                          garbage route
-------------------------------------------------------------------------------

                  type:  numeric (float)

                 range:  [101,513]                    units:  1
         unique values:  65                       missing .:  0/3,376

                  mean:   306.914
             std. dev:   141.504

           percentiles:        10%       25%       50%       75%       90%
                               107       204       307       410       507
```

c. In the dataset there are 52 calendar weeks of data (unique values).

Command + output:

```
. codebook calendar_week
```

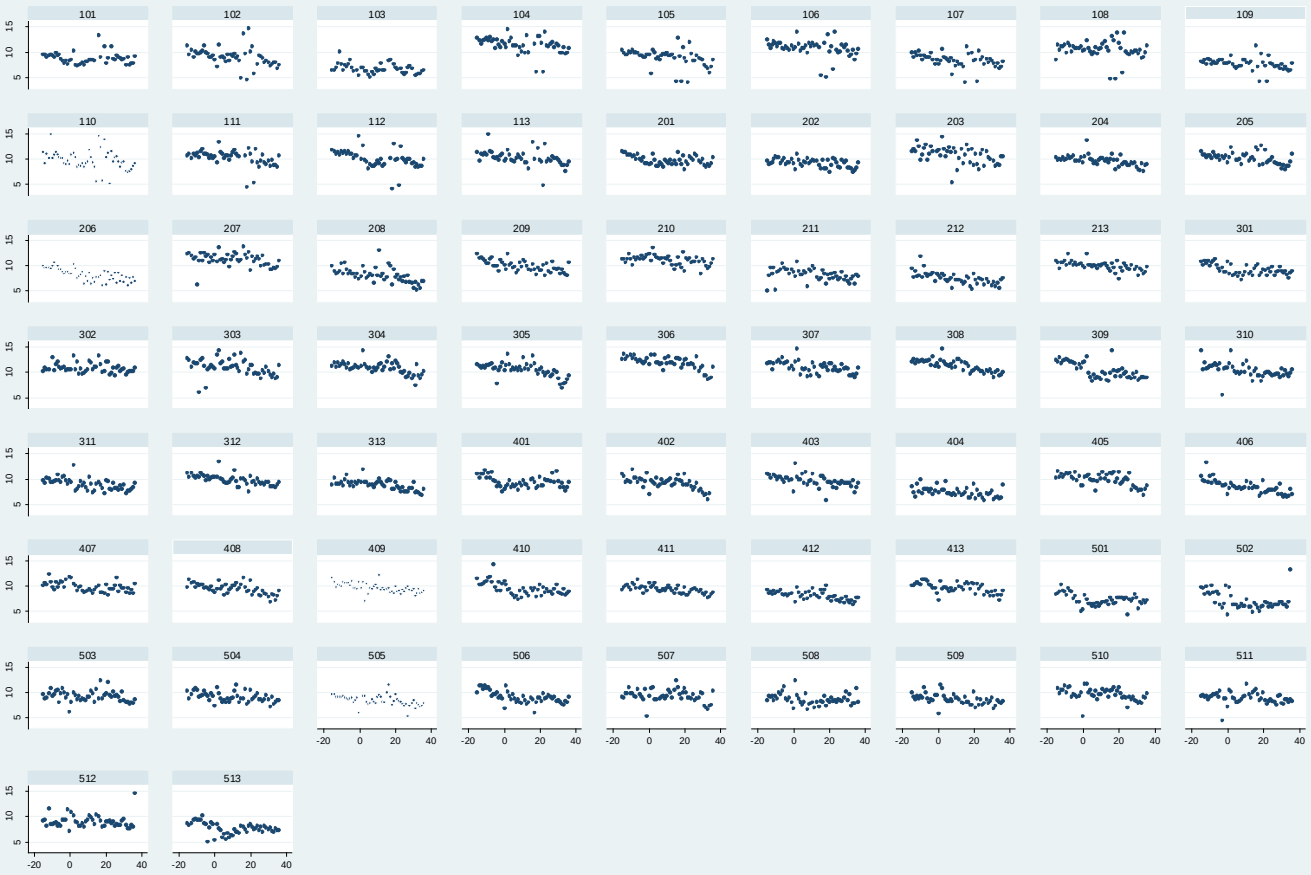
```
-------------------------------------------------------------------------------
calendar_week                                                   calendar week
-------------------------------------------------------------------------------

                  type:  numeric (float)

                 range:  [-15,36]                     units:  1
         unique values:  52                       missing .:  0/3,376

                  mean:   10.5142
             std. dev:   15.0122

           percentiles:        10%       25%       50%       75%       90%
                               -10      -2.5        11        24        31
```

d. Scatter graph of the outcome variable per calendar week.

Command:

```
graph twoway (scatter residual_weight calendar_week), by( route)
```

Output:

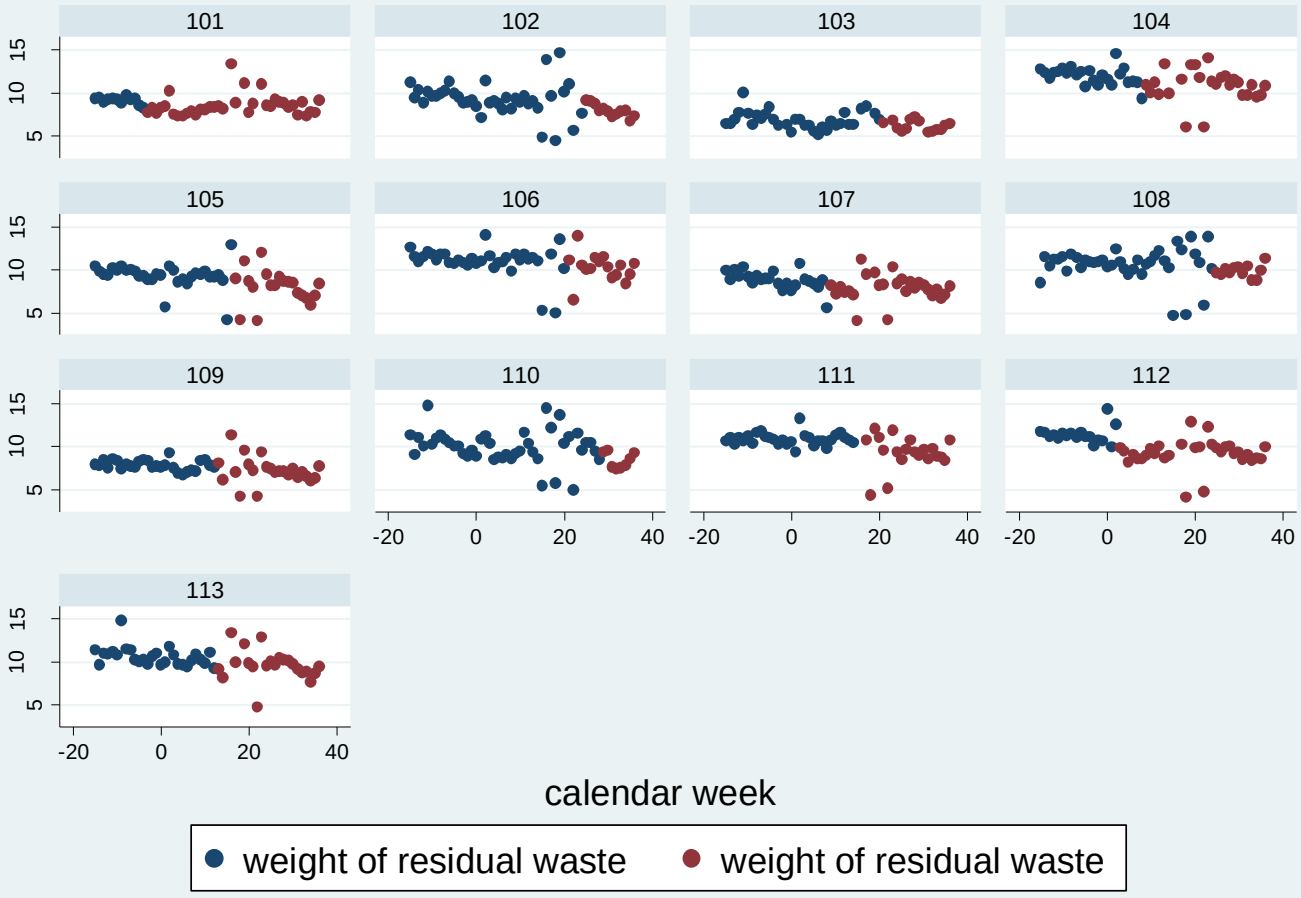


e. Scatter graph of the outcome variable per calendar week, pre- and post-treatment.

Command:

```
graph twoway (scatter residual_weight calendar_week if
TreatmentOngoing==0&TreatmentCompleted==0) (scatter residual_weight
calendar_week if TreatmentOngoing==1| TreatmentCompleted==1) if route<200,
by( route)
```

Output:



If the blue and red scattered dots are compared, we cannot clearly observe a difference. So, we do not clearly see a clear change in the weight of residual waste pre- and post-treatment. Thus, the raw data do not indicate that something is going on as of the date that the announcement letter was sent out.

III.

a. $residual\_weight_{it} = \beta_0 + \sum_{\tau=-T}^{T} \alpha_\tau W_\tau + \lambda_i + \mu_t + \varepsilon_{it}$

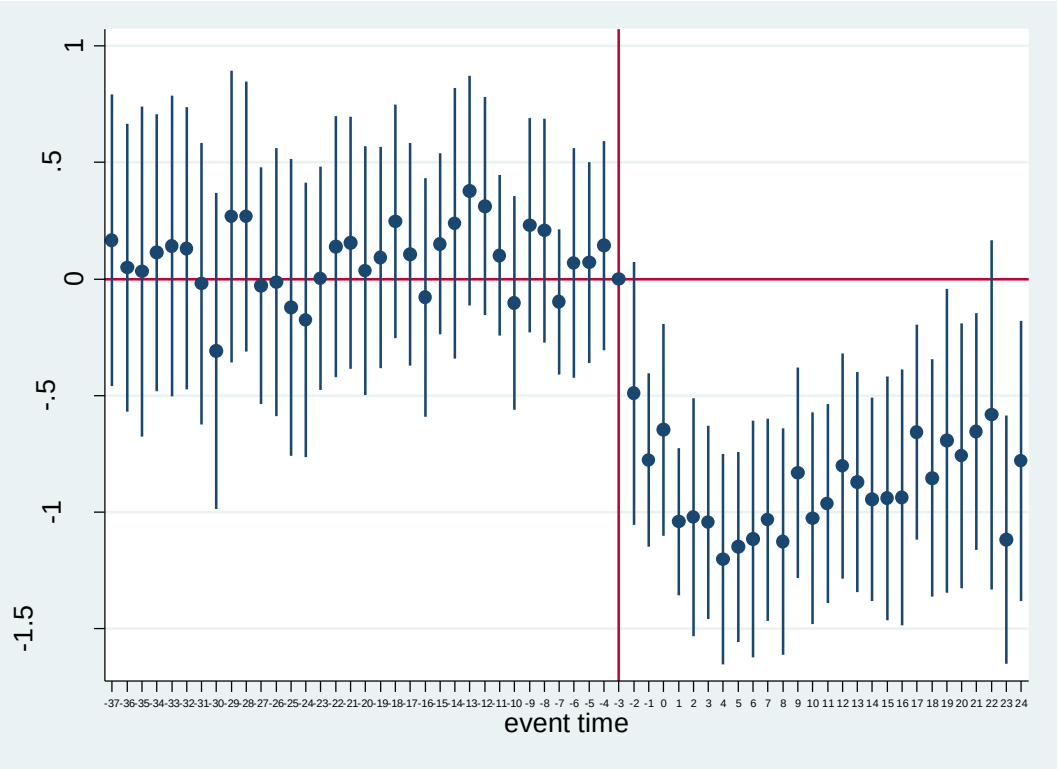
b. Commands + output:

```
. *IIIb
. sort route calendar_week

. by route: gen sumTreatmentOngoing=sum(TreatmentOngoing)

. sort route calendar_week

. by route: gen startweekTreatment_t=calendar_week if sumTreatmentOngoing==1
(3,311 missing values generated)

. sort route calendar_week

. by route: egen startweekTreatment=mean(startweekTreatment_t)

. drop startweekTreatment_t sumTreatmentOngoing

. gen eventtime=calendar_week-startweekTreatment

. drop startweekTreatment

. summ eventtime
```

Variable	Obs	Mean	Std. Dev.	Min	Max
eventtime	3,376	-4.790284	17.43736	-44	39

c. See log-file below

d.



IV.

a) As we ignored the time variation in the treatment, we are likely to overestimate the treatment effect since the short run treatment effect is likely greater than the long run treatment effect as can be concluded from the graph above. This can be seen from the upward trend of the scatter plot after treatment towards the null hypothesis of no change. When we do not cluster by route we can see that the standard error LetterReceived is greater. The standard errors of other variables slightly change as well. All the coefficients remain the same. For instance, the clustering gives a better representation of the LetterReceived standard errors as not every unit of the sample contributes information. Only every route contributes new information, therefore clustering by routes gives a more precise value for the standard errors.
The degree of serial correlation seems to be fairly large for the standard errors of the LetterReceived variable and other variables.

b) To find the number of weeks, we divide the absolute value of the initial treatment effect (LetterReceived coefficient) by the linear decay. We find that the number of weeks until the initial treatment effect has completely disappeared is approximately 37 weeks. This seems in line with the graph shown under III(d).

c) The long term effect is approximately 13.5 percent smaller than the short term effect.
Based on the F test, we are not able to reject the null hypothesis of no difference at conventional levels of statistical significance (1%, 5% and 10%).

```
 1 . log using "M:\Master\Methods Econometrics I\Log-file CA5a.smcl"
```

```
      name:  <unnamed>
       log:  M:\Master\Methods Econometrics I\Log-file CA5a.smcl
  log type:  smcl
 opened on:   2 Oct 2017, 13:59:48
```

```
 2 . do "C:\Users\u1266283\AppData\Local\Temp\STD00000000.tmp"

 3 . * Computer Assignment 5a
 4 . * I
 5 . * (a)
 6 . use "C:\Users\u1266283\Downloads\ca5a_bat_2016.dta"

 7 . xtset route calendar_week
       panel variable:  route (unbalanced)
        time variable:  calendar_week, -15 to 36, but with gaps
                delta:  1 unit

 8 .
 9 . * II
10 . * (a)
11 . sum calendar_week if LetterReceived==1
```

Variable	Obs	Mean	Std. Dev.	Min	Max
calendar_w~k	**175**	**14.65714**	**8.259244**	**-5**	**28**

```
12 . sum residual_weight if calendar_week<-6
```

Variable	Obs	Mean	Std. Dev.	Min	Max
residual_w~t	**579**	**10.28636**	**1.38393**	**5.1**	**14.8**

```
13 . * (b)
14 . codebook route
```

route

```
                  type:  numeric (float)

                 range:  [101,513]                    units:  1
         unique values:  65                       missing .:  0/3,376

                  mean:   306.914
             std. dev:   141.504

           percentiles:        10%       25%       50%       75%       90%
                               107       204       307       410       507
```

```
15 . * (c)
16 . codebook calendar_week
```

calendar_week

```
                  type:  numeric (float)

                 range:  [-15,36]                     units:  1
         unique values:  52                       missing .:  0/3,376

                  mean:   10.5142
             std. dev:   15.0122

           percentiles:        10%       25%       50%       75%       90%
                               -10      -2.5        11        24        31
```

```
17 . * (d)
18 . graph twoway (scatter residual_weight calendar_week), by(route)

19 . * (e)
20 . graph twoway (scatter residual_weight calendar_week if TreatmentOngoing==0&TreatmentCompleted
   > ted==1) if route<200, by(route)

21 .
22 . * III
23 . * (b)
24 . sort route calendar_week

25 . by route: gen sumTreatmentOngoing=sum(TreatmentOngoing)

26 . sort route calendar_week

27 . by route: gen startweekTreatment_t=calendar_week if sumTreatmentOngoing==1
   (3,311 missing values generated)

28 . sort route calendar_week

29 . by route: egen startweekTreatment=mean(startweekTreatment_t)

30 . drop startweekTreatment_t sumTreatmentOngoing

31 . gen eventtime=calendar_week-startweekTreatment

32 . drop startweekTreatment

33 . sum eventtime
```

Variable	Obs	Mean	Std. Dev.	Min	Max
eventtime	**3,376**	**-4.790284**	**17.43736**	**-44**	**39**

```
34 . * (c)
35 . tab calendar_week, gen(w)
```

calendar week	Freq.	Percent	Cum.
-15	**65**	**1.93**	**1.93**
-14	**65**	**1.93**	**3.85**
-13	**65**	**1.93**	**5.78**
-12	**64**	**1.90**	**7.67**
-11	**65**	**1.93**	**9.60**
-10	**65**	**1.93**	**11.52**
-9	**65**	**1.93**	**13.45**
-8	**65**	**1.93**	**15.37**
-7	**65**	**1.93**	**17.30**
-6	**65**	**1.93**	**19.22**
-5	**65**	**1.93**	**21.15**
-4	**65**	**1.93**	**23.07**
-3	**65**	**1.93**	**25.00**
-2	**65**	**1.93**	**26.93**
-1	**65**	**1.93**	**28.85**
0	**65**	**1.93**	**30.78**
1	**63**	**1.87**	**32.64**
2	**65**	**1.93**	**34.57**
3	**65**	**1.93**	**36.49**
4	**64**	**1.90**	**38.39**
5	**65**	**1.93**	**40.31**
6	**65**	**1.93**	**42.24**
7	**65**	**1.93**	**44.16**
8	**65**	**1.93**	**46.09**
9	**65**	**1.93**	**48.02**
10	**65**	**1.93**	**49.94**
11	**65**	**1.93**	**51.87**
12	**65**	**1.93**	**53.79**
13	**65**	**1.93**	**55.72**
14	**65**	**1.93**	**57.64**
15	**65**	**1.93**	**59.57**

16	65	1.93	61.49
17	65	1.93	63.42
18	65	1.93	65.34
19	65	1.93	67.27
20	65	1.93	69.19
21	65	1.93	71.12
22	65	1.93	73.05
23	65	1.93	74.97
24	65	1.93	76.90
25	65	1.93	78.82
26	65	1.93	80.75
27	65	1.93	82.67
28	65	1.93	84.60
29	65	1.93	86.52
30	65	1.93	88.45
31	65	1.93	90.37
32	65	1.93	92.30
33	65	1.93	94.22
34	65	1.93	96.15
35	65	1.93	98.07
36	65	1.93	100.00
Total	3,376	100.00	

36 . tab eventtime, gen(e)

eventtime	Freq.	Percent	Cum.
-44	5	0.15	0.15
-43	5	0.15	0.30
-42	5	0.15	0.44
-41	5	0.15	0.59
-40	15	0.44	1.04
-39	15	0.44	1.48
-38	15	0.44	1.93
-37	15	0.44	2.37
-36	25	0.74	3.11
-35	25	0.74	3.85
-34	25	0.74	4.59
-33	25	0.74	5.33
-32	35	1.04	6.37
-31	35	1.04	7.41
-30	35	1.04	8.44
-29	35	1.04	9.48
-28	45	1.33	10.81
-27	45	1.33	12.14
-26	45	1.33	13.48
-25	43	1.27	14.75
-24	55	1.63	16.38
-23	55	1.63	18.01
-22	55	1.63	19.64
-21	55	1.63	21.27
-20	54	1.60	22.87
-19	55	1.63	24.50
-18	60	1.78	26.27
-17	60	1.78	28.05
-16	60	1.78	29.83
-15	60	1.78	31.61
-14	60	1.78	33.38
-13	60	1.78	35.16
-12	65	1.93	37.09
-11	65	1.93	39.01
-10	65	1.93	40.94
-9	65	1.93	42.86
-8	64	1.90	44.76
-7	65	1.93	46.68
-6	65	1.93	48.61
-5	65	1.93	50.53
-4	65	1.93	52.46
-3	65	1.93	54.38
-2	65	1.93	56.31
-1	65	1.93	58.23

0	**65**	**1.93**	**60.16**
1	**65**	**1.93**	**62.09**
2	**65**	**1.93**	**64.01**
3	**65**	**1.93**	**65.94**
4	**65**	**1.93**	**67.86**
5	**65**	**1.93**	**69.79**
6	**65**	**1.93**	**71.71**
7	**65**	**1.93**	**73.64**
8	**60**	**1.78**	**75.41**
9	**60**	**1.78**	**77.19**
10	**60**	**1.78**	**78.97**
11	**60**	**1.78**	**80.75**
12	**50**	**1.48**	**82.23**
13	**50**	**1.48**	**83.71**
14	**50**	**1.48**	**85.19**
15	**50**	**1.48**	**86.67**
16	**40**	**1.18**	**87.86**
17	**40**	**1.18**	**89.04**
18	**40**	**1.18**	**90.23**
19	**40**	**1.18**	**91.41**
20	**30**	**0.89**	**92.30**
21	**30**	**0.89**	**93.19**
22	**30**	**0.89**	**94.08**
23	**30**	**0.89**	**94.96**
24	**20**	**0.59**	**95.56**
25	**20**	**0.59**	**96.15**
26	**20**	**0.59**	**96.74**
27	**20**	**0.59**	**97.33**
28	**10**	**0.30**	**97.63**
29	**10**	**0.30**	**97.93**
30	**10**	**0.30**	**98.22**
31	**10**	**0.30**	**98.52**
32	**10**	**0.30**	**98.82**
33	**10**	**0.30**	**99.11**
34	**5**	**0.15**	**99.26**
35	**5**	**0.15**	**99.41**
36	**5**	**0.15**	**99.56**
37	**5**	**0.15**	**99.70**
38	**5**	**0.15**	**99.85**
39	**5**	**0.15**	**100.00**
Total	**3,376**	**100.00**	

```
37 . gen em37_m44=0

38 . replace em37_m44=1 if e1==1|e2==1|e3==1|e4==1|e5==1|e6==1|e7==1|e8==1
   (80 real changes made)

39 . gen e24_39=0

40 . replace e24_39=1 if e69==1|e70==1|e71==1|e72==1|e73==1|e74==1|e75==1|e76==1|e77==1|e78==1|e79
   (170 real changes made)

41 . xtreg residual_weight em37_m44 e9-e41 e43-e68 e24_39 w2-w52, fe i(route) cluster(route)

   Fixed-effects (within) regression               Number of obs     =      3,340
   Group variable: route                           Number of groups  =         65

   R-sq:                                           Obs per group:
        within  = 0.4528                                         min =         47
        between = 0.0561                                         avg =       51.4
        overall = 0.2643                                         max =         52

                                                   F(64,64)          =          .
   corr(u_i, Xb)  = 0.0202                         Prob > F          =          .
```

(Std. Err. adjusted for **65** clusters in route)

residual_w~t	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
em37_m44	.1660996	.3753856	0.44	0.660	-.5838194	.9160186
e9	.0492043	.3699015	0.13	0.895	-.689759	.7881676
e10	.0325016	.4244292	0.08	0.939	-.8153931	.8803963
e11	.1135185	.3565627	0.32	0.751	-.5987974	.8258343
e12	.1410174	.3864242	0.36	0.716	-.6309537	.9129885
e13	.1321758	.3620965	0.37	0.716	-.591195	.8555466
e14	-.0206161	.3614777	-0.06	0.955	-.7427507	.7015186
e15	-.3085103	.4056539	-0.76	0.450	-1.118897	.5018764
e16	.2679701	.3755905	0.71	0.478	-.4823582	1.018298
e17	.2686443	.3468229	0.77	0.441	-.4242141	.9615027
e18	-.0298329	.3042595	-0.10	0.922	-.6376612	.5779953
e19	-.0141994	.3446306	-0.04	0.967	-.7026782	.6742793
e20	-.1222256	.3819468	-0.32	0.750	-.8852521	.6408009
e21	-.1752506	.3529327	-0.50	0.621	-.8803148	.5298136
e22	.0026389	.2865432	0.01	0.993	-.569797	.5750748
e23	.1393598	.3354026	0.42	0.679	-.5306838	.8094035
e24	.1558172	.3236079	0.48	0.632	-.4906639	.8022982
e25	.036003	.3201239	0.11	0.911	-.6035179	.675524
e26	.09244	.2838208	0.33	0.746	-.4745573	.6594373
e27	.2462243	.300092	0.82	0.415	-.3532783	.8457269
e28	.1058485	.2857457	0.37	0.712	-.4649943	.6766912
e29	-.0788001	.3063948	-0.26	0.798	-.690894	.5332938
e30	.1507689	.2327261	0.65	0.519	-.314155	.6156928
e31	.2390666	.3474272	0.69	0.494	-.4549991	.9331322
e32	.378625	.2956212	1.28	0.205	-.2119463	.9691962
e33	.3127542	.280422	1.12	0.269	-.2474531	.8729615
e34	.1019633	.2060141	0.49	0.622	-.3095971	.5135237
e35	-.1026395	.2751331	-0.37	0.710	-.6522812	.4470021
e36	.2306286	.2759282	0.84	0.406	-.3206013	.7818585
e37	.2084093	.2877271	0.72	0.472	-.3663917	.7832102
e38	-.0977933	.1868086	-0.52	0.602	-.4709864	.2753998
e39	.0684474	.2956226	0.23	0.818	-.5221266	.6590214
e40	.0709874	.2585554	0.27	0.785	-.4455365	.5875112
e41	.1432294	.2690172	0.53	0.596	-.3941942	.680653
e43	-.490191	.3380811	-1.45	0.152	-1.165586	.1852036
e44	-.7773395	.2231218	-3.48	0.001	-1.223077	-.3316024
e45	-.646476	.2722476	-2.37	0.021	-1.190353	-.1025988
e46	-1.040911	.1893322	-5.50	0.000	-1.419146	-.6626769
e47	-1.022562	.3060556	-3.34	0.001	-1.633979	-.4111456
e48	-1.044916	.2484016	-4.21	0.000	-1.541156	-.548677
e49	-1.202347	.2702203	-4.45	0.000	-1.742175	-.6625202
e50	-1.148927	.2442134	-4.70	0.000	-1.6368	-.6610549
e51	-1.115251	.3040191	-3.67	0.000	-1.722599	-.5079033
e52	-1.032261	.2598243	-3.97	0.000	-1.551319	-.5132019
e53	-1.125932	.2912901	-3.87	0.000	-1.707851	-.5440129
e54	-.8318131	.271006	-3.07	0.003	-1.37321	-.2904163
e55	-1.027551	.2722047	-3.77	0.000	-1.571343	-.4837598
e56	-.9632684	.2550999	-3.78	0.000	-1.472889	-.4536477
e57	-.8023489	.2889262	-2.78	0.007	-1.379545	-.2251525
e58	-.8708884	.2833805	-3.07	0.003	-1.437006	-.3047708
e59	-.944821	.2618405	-3.61	0.001	-1.467907	-.4217345
e60	-.9410427	.3126982	-3.01	0.004	-1.565729	-.3163562
e61	-.9374029	.3286817	-2.85	0.006	-1.59402	-.2807857
e62	-.6575268	.2760276	-2.38	0.020	-1.208955	-.1060982
e63	-.8539899	.3046378	-2.80	0.007	-1.462574	-.245406
e64	-.6938821	.390759	-1.78	0.081	-1.474513	.0867487
e65	-.7584854	.3401587	-2.23	0.029	-1.438031	-.0789403
e66	-.6539317	.3040874	-2.15	0.035	-1.261416	-.0464473
e67	-.5839641	.4487894	-1.30	0.198	-1.480524	.3125958
e68	-1.118006	.3186791	-3.51	0.001	-1.75464	-.4813709
e24_39	-.7802495	.3602475	-2.17	0.034	-1.499927	-.0605724
w2	-.1458825	.2199268	-0.66	0.510	-.5852368	.2934718
w3	-.1952443	.1550219	-1.26	0.212	-.5049361	.1144475
w4	-.0463937	.2217447	-0.21	0.835	-.4893796	.3965923
w5	.0539994	.1778924	0.30	0.762	-.3013815	.4093803
w6	-.1000439	.228607	-0.44	0.663	-.5567389	.3566512
w7	-.2570051	.1667041	-1.54	0.128	-.5900348	.0760247

w8	.2224097	.2063382	1.08	0.285	-.1897983	.6346178
w9	.0248986	.1547786	0.16	0.873	-.2843072	.3341044
w10	-.1565313	.20897	-0.75	0.457	-.5739969	.2609342
w11	-.508969	.1652526	-3.08	0.003	-.8390991	-.1788389
w12	-.5429949	.2341053	-2.32	0.024	-1.010674	-.0753158
w13	-.987833	.2194342	-4.50	0.000	-1.426203	-.5494628
w14	-.655579	.2179479	-3.01	0.004	-1.09098	-.220178
w15	-.602797	.175084	-3.44	0.001	-.9525675	-.2530265
w16	-1.366639	.287685	-4.75	0.000	-1.941356	-.7919222
w17	-.303524	.1981473	-1.53	0.130	-.6993688	.0923207
w18	1.039669	.2564467	4.05	0.000	.5273582	1.55198
w19	-.5450746	.2069132	-2.63	0.011	-.9584312	-.1317181
w20	-1.006206	.2176251	-4.62	0.000	-1.440962	-.5714504
w21	-1.227681	.2078887	-5.91	0.000	-1.642986	-.8123752
w22	-1.148742	.2397597	-4.79	0.000	-1.627717	-.669767
w23	-.923712	.1977394	-4.67	0.000	-1.318742	-.5286821
w24	-1.576162	.2352405	-6.70	0.000	-2.046109	-1.106215
w25	-.7404319	.2260656	-3.28	0.002	-1.19205	-.2888139
w26	-.7657173	.240465	-3.18	0.002	-1.246101	-.2853333
w27	.2814851	.2357522	1.19	0.237	-.189484	.7524542
w28	-.4398417	.2488202	-1.77	0.082	-.9369172	.0572338
w29	-.7249511	.2523585	-2.87	0.006	-1.229095	-.220807
w30	-1.16397	.2700924	-4.31	0.000	-1.703542	-.6243989
w31	-.5716019	.3316393	-1.72	0.090	-1.234127	.0909237
w32	.8972927	.3064984	2.93	0.005	.2849918	1.509594
w33	-.020938	.2667222	-0.08	0.938	-.5537769	.5119009
w34	-1.838351	.3666304	-5.01	0.000	-2.570779	-1.105922
w35	.1474803	.3050389	0.48	0.630	-.461905	.7568656
w36	-.0131139	.2920986	-0.04	0.964	-.5966479	.5704202
w37	-.2790308	.2777571	-1.00	0.319	-.8339144	.2758528
w38	-1.300405	.3884478	-3.35	0.001	-2.076419	-.5243914
w39	.0520897	.3087953	0.17	0.867	-.5647998	.6689791
w40	-.2861638	.2877138	-0.99	0.324	-.8609381	.2886105
w41	-.5789986	.3057791	-1.89	0.063	-1.189863	.0318654
w42	-.6432762	.3395555	-1.89	0.063	-1.321616	.0350638
w43	-.1967645	.3108262	-0.63	0.529	-.8177111	.4241822
w44	-.5202993	.3014543	-1.73	0.089	-1.122524	.0819249
w45	-.3151835	.3380297	-0.93	0.355	-.9904755	.3601085
w46	-.6083392	.3616318	-1.68	0.097	-1.330782	.1141033
w47	-1.386059	.2835013	-4.89	0.000	-1.952418	-.8196997
w48	-1.137434	.3121758	-3.64	0.001	-1.761077	-.5137913
w49	-1.241023	.3526181	-3.52	0.001	-1.945458	-.5365871
w50	-1.607287	.3472863	-4.63	0.000	-2.301071	-.9135031
w51	-.9703762	.2893231	-3.35	0.001	-1.548366	-.3923868
w52	-.1587337	.3295077	-0.48	0.632	-.8170011	.4995337
_cons	10.27143	.3282694	31.29	0.000	9.615641	10.92723
sigma_u	1.1291756					
sigma_e	.9311568					
rho	.59523048	(fraction of variance due to u_i)				

```
42 . * (d)
43 . ssc install coefplot
   checking coefplot consistency and verifying not already installed...
   all files already exist and are up to date.

44 . xtreg residual_weight em37_m44 e9-e41 e43-e68 e24_39 e42 w2-w52, fe i(route) cluster(route)
   note: e42 omitted because of collinearity

   Fixed-effects (within) regression               Number of obs      =       3,340
   Group variable: route                           Number of groups   =          65

   R-sq:                                           Obs per group:
        within  = 0.4528                                         min =          47
        between = 0.0561                                         avg =        51.4
        overall = 0.2643                                         max =          52

                                                   F(64,64)           =           .
   corr(u_i, Xb)  = 0.0202                         Prob > F           =           .
```

(Std. Err. adjusted for **65** clusters in route)

residual_w~t	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
em37_m44	.1660996	.3753856	0.44	0.660	-.5838194	.9160186
e9	.0492043	.3699015	0.13	0.895	-.689759	.7881676
e10	.0325016	.4244292	0.08	0.939	-.8153931	.8803963
e11	.1135185	.3565627	0.32	0.751	-.5987974	.8258343
e12	.1410174	.3864242	0.36	0.716	-.6309537	.9129885
e13	.1321758	.3620965	0.37	0.716	-.591195	.8555466
e14	-.0206161	.3614777	-0.06	0.955	-.7427507	.7015186
e15	-.3085103	.4056539	-0.76	0.450	-1.118897	.5018764
e16	.2679701	.3755905	0.71	0.478	-.4823582	1.018298
e17	.2686443	.3468229	0.77	0.441	-.4242141	.9615027
e18	-.0298329	.3042595	-0.10	0.922	-.6376612	.5779953
e19	-.0141994	.3446306	-0.04	0.967	-.7026782	.6742793
e20	-.1222256	.3819468	-0.32	0.750	-.8852521	.6408009
e21	-.1752506	.3529327	-0.50	0.621	-.8803148	.5298136
e22	.0026389	.2865432	0.01	0.993	-.569797	.5750748
e23	.1393598	.3354026	0.42	0.679	-.5306838	.8094035
e24	.1558172	.3236079	0.48	0.632	-.4906639	.8022982
e25	.036003	.3201239	0.11	0.911	-.6035179	.675524
e26	.09244	.2838208	0.33	0.746	-.4745573	.6594373
e27	.2462243	.300092	0.82	0.415	-.3532783	.8457269
e28	.1058485	.2857457	0.37	0.712	-.4649943	.6766912
e29	-.0788001	.3063948	-0.26	0.798	-.690894	.5332938
e30	.1507689	.2327261	0.65	0.519	-.314155	.6156928
e31	.2390666	.3474272	0.69	0.494	-.4549991	.9331322
e32	.378625	.2956212	1.28	0.205	-.2119463	.9691962
e33	.3127542	.280422	1.12	0.269	-.2474531	.8729615
e34	.1019633	.2060141	0.49	0.622	-.3095971	.5135237
e35	-.1026395	.2751331	-0.37	0.710	-.6522812	.4470021
e36	.2306286	.2759282	0.84	0.406	-.3206013	.7818585
e37	.2084093	.2877271	0.72	0.472	-.3663917	.7832102
e38	-.0977933	.1868086	-0.52	0.602	-.4709864	.2753998
e39	.0684474	.2956226	0.23	0.818	-.5221266	.6590214
e40	.0709874	.2585554	0.27	0.785	-.4455365	.5875112
e41	.1432294	.2690172	0.53	0.596	-.3941942	.680653
e43	-.490191	.3380811	-1.45	0.152	-1.165586	.1852036
e44	-.7773395	.2231218	-3.48	0.001	-1.223077	-.3316024
e45	-.646476	.2722476	-2.37	0.021	-1.190353	-.1025988
e46	-1.040911	.1893322	-5.50	0.000	-1.419146	-.6626769
e47	-1.022562	.3060556	-3.34	0.001	-1.633979	-.4111456
e48	-1.044916	.2484016	-4.21	0.000	-1.541156	-.548677
e49	-1.202347	.2702203	-4.45	0.000	-1.742175	-.6625202
e50	-1.148927	.2442134	-4.70	0.000	-1.6368	-.6610549
e51	-1.115251	.3040191	-3.67	0.000	-1.722599	-.5079033
e52	-1.032261	.2598243	-3.97	0.000	-1.551319	-.5132019
e53	-1.125932	.2912901	-3.87	0.000	-1.707851	-.5440129
e54	-.8318131	.271006	-3.07	0.003	-1.37321	-.2904163
e55	-1.027551	.2722047	-3.77	0.000	-1.571343	-.4837598
e56	-.9632684	.2550999	-3.78	0.000	-1.472889	-.4536477
e57	-.8023489	.2889262	-2.78	0.007	-1.379545	-.2251525
e58	-.8708884	.2833805	-3.07	0.003	-1.437006	-.3047708
e59	-.944821	.2618405	-3.61	0.001	-1.467907	-.4217345
e60	-.9410427	.3126982	-3.01	0.004	-1.565729	-.3163562
e61	-.9374029	.3286817	-2.85	0.006	-1.59402	-.2807857
e62	-.6575268	.2760276	-2.38	0.020	-1.208955	-.1060982
e63	-.8539899	.3046378	-2.80	0.007	-1.462574	-.245406
e64	-.6938821	.390759	-1.78	0.081	-1.474513	.0867487
e65	-.7584854	.3401587	-2.23	0.029	-1.438031	-.0789403
e66	-.6539317	.3040874	-2.15	0.035	-1.261416	-.0464473
e67	-.5839641	.4487894	-1.30	0.198	-1.480524	.3125958
e68	-1.118006	.3186791	-3.51	0.001	-1.75464	-.4813709
e24_39	-.7802495	.3602475	-2.17	0.034	-1.499927	-.0605724
e42	0	(omitted)				
w2	-.1458825	.2199268	-0.66	0.510	-.5852368	.2934718
w3	-.1952443	.1550219	-1.26	0.212	-.5049361	.1144475
w4	-.0463937	.2217447	-0.21	0.835	-.4893796	.3965923
w5	.0539994	.1778924	0.30	0.762	-.3013815	.4093803
w6	-.1000439	.228607	-0.44	0.663	-.5567389	.3566512

w7	-.2570051	.1667041	-1.54	0.128	-.5900348	.0760247
w8	.2224097	.2063382	1.08	0.285	-.1897983	.6346178
w9	.0248986	.1547786	0.16	0.873	-.2843072	.3341044
w10	-.1565313	.20897	-0.75	0.457	-.5739969	.2609342
w11	-.508969	.1652526	-3.08	0.003	-.8390991	-.1788389
w12	-.5429949	.2341053	-2.32	0.024	-1.010674	-.0753158
w13	-.987833	.2194342	-4.50	0.000	-1.426203	-.5494628
w14	-.655579	.2179479	-3.01	0.004	-1.09098	-.220178
w15	-.602797	.175084	-3.44	0.001	-.9525675	-.2530265
w16	-1.366639	.287685	-4.75	0.000	-1.941356	-.7919222
w17	-.303524	.1981473	-1.53	0.130	-.6993688	.0923207
w18	1.039669	.2564467	4.05	0.000	.5273582	1.55198
w19	-.5450746	.2069132	-2.63	0.011	-.9584312	-.1317181
w20	-1.006206	.2176251	-4.62	0.000	-1.440962	-.5714504
w21	-1.227681	.2078887	-5.91	0.000	-1.642986	-.8123752
w22	-1.148742	.2397597	-4.79	0.000	-1.627717	-.669767
w23	-.923712	.1977394	-4.67	0.000	-1.318742	-.5286821
w24	-1.576162	.2352405	-6.70	0.000	-2.046109	-1.106215
w25	-.7404319	.2260656	-3.28	0.002	-1.19205	-.2888139
w26	-.7657173	.240465	-3.18	0.002	-1.246101	-.2853333
w27	.2814851	.2357522	1.19	0.237	-.189484	.7524542
w28	-.4398417	.2488202	-1.77	0.082	-.9369172	.0572338
w29	-.7249511	.2523585	-2.87	0.006	-1.229095	-.220807
w30	-1.16397	.2700924	-4.31	0.000	-1.703542	-.6243989
w31	-.5716019	.3316393	-1.72	0.090	-1.234127	.0909237
w32	.8972927	.3064984	2.93	0.005	.2849918	1.509594
w33	-.020938	.2667222	-0.08	0.938	-.5537769	.5119009
w34	-1.838351	.3666304	-5.01	0.000	-2.570779	-1.105922
w35	.1474803	.3050389	0.48	0.630	-.461905	.7568656
w36	-.0131139	.2920986	-0.04	0.964	-.5966479	.5704202
w37	-.2790308	.2777571	-1.00	0.319	-.8339144	.2758528
w38	-1.300405	.3884478	-3.35	0.001	-2.076419	-.5243914
w39	.0520897	.3087953	0.17	0.867	-.5647998	.6689791
w40	-.2861638	.2877138	-0.99	0.324	-.8609381	.2886105
w41	-.5789986	.3057791	-1.89	0.063	-1.189863	.0318654
w42	-.6432762	.3395555	-1.89	0.063	-1.321616	.0350638
w43	-.1967645	.3108262	-0.63	0.529	-.8177111	.4241822
w44	-.5202993	.3014543	-1.73	0.089	-1.122524	.0819249
w45	-.3151835	.3380297	-0.93	0.355	-.9904755	.3601085
w46	-.6083392	.3616318	-1.68	0.097	-1.330782	.1141033
w47	-1.386059	.2835013	-4.89	0.000	-1.952418	-.8196997
w48	-1.137434	.3121758	-3.64	0.001	-1.761077	-.5137913
w49	-1.241023	.3526181	-3.52	0.001	-1.945458	-.5365871
w50	-1.607287	.3472863	-4.63	0.000	-2.301071	-.9135031
w51	-.9703762	.2893231	-3.35	0.001	-1.548366	-.3923868
w52	-.1587337	.3295077	-0.48	0.632	-.8170011	.4995337
_cons	10.27143	.3282694	31.29	0.000	9.615641	10.92723
sigma_u	1.1291756					
sigma_e	.9311568					
rho	.59523048	(fraction of variance due to u_i)				

```
45 . coefplot, keep(e*) nolabels coeflabels(,labsize(tiny)) vertical xline(35) levels(90) yline(0)
   > (em37_m44 e9 e10 e11 e12 e13 e14 e15 e16 e17 e18 e19 e20 e21 e22 e23 e24 e25 e26 e27 e28 e29
   >  e51 e52 e53 e54 e55 e56 e57 e58 e59 e60 e61 e62 e63 e64 e65 e66 e67 e68 e24_39)

46 .
47 . drop e1-e8
```

```
48 . ren em37_m44 e8

49 . drop e69-e84

50 . ren e24_39 e69

51 . forvalues i=8/69 {
     2. label variable e`i' "`=`i'-45'"
     3. }

52 .
53 . xtreg residual_weight e8 e9-e41 e43-e68 e69 e42 w2-w52, fe i(route) cluster(route)
   note: e42 omitted because of collinearity
```

Fixed-effects (within) regression — Number of obs = **3,340**
Group variable: **route** — Number of groups = **65**

R-sq:
within = **0.4528**
between = **0.0561**
overall = **0.2643**

Obs per group:
min = **47**
avg = **51.4**
max = **52**

F(64,64) = .
corr(u_i, Xb) = **0.0202** — Prob > F = .

(Std. Err. adjusted for **65** clusters in route)

residual_w~t	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
e8	.1660996	.3753856	0.44	0.660	-.5838194	.9160186
e9	.0492043	.3699015	0.13	0.895	-.689759	.7881676
e10	.0325016	.4244292	0.08	0.939	-.8153931	.8803963
e11	.1135185	.3565627	0.32	0.751	-.5987974	.8258343
e12	.1410174	.3864242	0.36	0.716	-.6309537	.9129885
e13	.1321758	.3620965	0.37	0.716	-.591195	.8555466
e14	-.0206161	.3614777	-0.06	0.955	-.7427507	.7015186
e15	-.3085103	.4056539	-0.76	0.450	-1.118897	.5018764
e16	.2679701	.3755905	0.71	0.478	-.4823582	1.018298
e17	.2686443	.3468229	0.77	0.441	-.4242141	.9615027
e18	-.0298329	.3042595	-0.10	0.922	-.6376612	.5779953
e19	-.0141994	.3446306	-0.04	0.967	-.7026782	.6742793
e20	-.1222256	.3819468	-0.32	0.750	-.8852521	.6408009
e21	-.1752506	.3529327	-0.50	0.621	-.8803148	.5298136
e22	.0026389	.2865432	0.01	0.993	-.569797	.5750748
e23	.1393598	.3354026	0.42	0.679	-.5306838	.8094035
e24	.1558172	.3236079	0.48	0.632	-.4906639	.8022982
e25	.036003	.3201239	0.11	0.911	-.6035179	.675524
e26	.09244	.2838208	0.33	0.746	-.4745573	.6594373
e27	.2462243	.300092	0.82	0.415	-.3532783	.8457269
e28	.1058485	.2857457	0.37	0.712	-.4649943	.6766912
e29	-.0788001	.3063948	-0.26	0.798	-.690894	.5332938
e30	.1507689	.2327261	0.65	0.519	-.314155	.6156928
e31	.2390666	.3474272	0.69	0.494	-.4549991	.9331322
e32	.378625	.2956212	1.28	0.205	-.2119463	.9691962
e33	.3127542	.280422	1.12	0.269	-.2474531	.8729615
e34	.1019633	.2060141	0.49	0.622	-.3095971	.5135237
e35	-.1026395	.2751331	-0.37	0.710	-.6522812	.4470021
e36	.2306286	.2759282	0.84	0.406	-.3206013	.7818585
e37	.2084093	.2877271	0.72	0.472	-.3663917	.7832102
e38	-.0977933	.1868086	-0.52	0.602	-.4709864	.2753998
e39	.0684474	.2956226	0.23	0.818	-.5221266	.6590214
e40	.0709874	.2585554	0.27	0.785	-.4455365	.5875112
e41	.1432294	.2690172	0.53	0.596	-.3941942	.680653
e43	-.490191	.3380811	-1.45	0.152	-1.165586	.1852036
e44	-.7773395	.2231218	-3.48	0.001	-1.223077	-.3316024
e45	-.646476	.2722476	-2.37	0.021	-1.190353	-.1025988
e46	-1.040911	.1893322	-5.50	0.000	-1.419146	-.6626769
e47	-1.022562	.3060556	-3.34	0.001	-1.633979	-.4111456
e48	-1.044916	.2484016	-4.21	0.000	-1.541156	-.548677
e49	-1.202347	.2702203	-4.45	0.000	-1.742175	-.6625202
e50	-1.148927	.2442134	-4.70	0.000	-1.6368	-.6610549

e51	-1.115251	.3040191	-3.67	0.000	-1.722599	-.5079033
e52	-1.032261	.2598243	-3.97	0.000	-1.551319	-.5132019
e53	-1.125932	.2912901	-3.87	0.000	-1.707851	-.5440129
e54	-.8318131	.271006	-3.07	0.003	-1.37321	-.2904163
e55	-1.027551	.2722047	-3.77	0.000	-1.571343	-.4837598
e56	-.9632684	.2550999	-3.78	0.000	-1.472889	-.4536477
e57	-.8023489	.2889262	-2.78	0.007	-1.379545	-.2251525
e58	-.8708884	.2833805	-3.07	0.003	-1.437006	-.3047708
e59	-.944821	.2618405	-3.61	0.001	-1.467907	-.4217345
e60	-.9410427	.3126982	-3.01	0.004	-1.565729	-.3163562
e61	-.9374029	.3286817	-2.85	0.006	-1.59402	-.2807857
e62	-.6575268	.2760276	-2.38	0.020	-1.208955	-.1060982
e63	-.8539899	.3046378	-2.80	0.007	-1.462574	-.245406
e64	-.6938821	.390759	-1.78	0.081	-1.474513	.0867487
e65	-.7584854	.3401587	-2.23	0.029	-1.438031	-.0789403
e66	-.6539317	.3040874	-2.15	0.035	-1.261416	-.0464473
e67	-.5839641	.4487894	-1.30	0.198	-1.480524	.3125958
e68	-1.118006	.3186791	-3.51	0.001	-1.75464	-.4813709
e69	-.7802495	.3602475	-2.17	0.034	-1.499927	-.0605724
e42	0	(omitted)				
w2	-.1458825	.2199268	-0.66	0.510	-.5852368	.2934718
w3	-.1952443	.1550219	-1.26	0.212	-.5049361	.1144475
w4	-.0463937	.2217447	-0.21	0.835	-.4893796	.3965923
w5	.0539994	.1778924	0.30	0.762	-.3013815	.4093803
w6	-.1000439	.228607	-0.44	0.663	-.5567389	.3566512
w7	-.2570051	.1667041	-1.54	0.128	-.5900348	.0760247
w8	.2224097	.2063382	1.08	0.285	-.1897983	.6346178
w9	.0248986	.1547786	0.16	0.873	-.2843072	.3341044
w10	-.1565313	.20897	-0.75	0.457	-.5739969	.2609342
w11	-.508969	.1652526	-3.08	0.003	-.8390991	-.1788389
w12	-.5429949	.2341053	-2.32	0.024	-1.010674	-.0753158
w13	-.987833	.2194342	-4.50	0.000	-1.426203	-.5494628
w14	-.655579	.2179479	-3.01	0.004	-1.09098	-.220178
w15	-.602797	.175084	-3.44	0.001	-.9525675	-.2530265
w16	-1.366639	.287685	-4.75	0.000	-1.941356	-.7919222
w17	-.303524	.1981473	-1.53	0.130	-.6993688	.0923207
w18	1.039669	.2564467	4.05	0.000	.5273582	1.55198
w19	-.5450746	.2069132	-2.63	0.011	-.9584312	-.1317181
w20	-1.006206	.2176251	-4.62	0.000	-1.440962	-.5714504
w21	-1.227681	.2078887	-5.91	0.000	-1.642986	-.8123752
w22	-1.148742	.2397597	-4.79	0.000	-1.627717	-.669767
w23	-.923712	.1977394	-4.67	0.000	-1.318742	-.5286821
w24	-1.576162	.2352405	-6.70	0.000	-2.046109	-1.106215
w25	-.7404319	.2260656	-3.28	0.002	-1.19205	-.2888139
w26	-.7657173	.240465	-3.18	0.002	-1.246101	-.2853333
w27	.2814851	.2357522	1.19	0.237	-.189484	.7524542
w28	-.4398417	.2488202	-1.77	0.082	-.9369172	.0572338
w29	-.7249511	.2523585	-2.87	0.006	-1.229095	-.220807
w30	-1.16397	.2700924	-4.31	0.000	-1.703542	-.6243989
w31	-.5716019	.3316393	-1.72	0.090	-1.234127	.0909237
w32	.8972927	.3064984	2.93	0.005	.2849918	1.509594
w33	-.020938	.2667222	-0.08	0.938	-.5537769	.5119009
w34	-1.838351	.3666304	-5.01	0.000	-2.570779	-1.105922
w35	.1474803	.3050389	0.48	0.630	-.461905	.7568656
w36	-.0131139	.2920986	-0.04	0.964	-.5966479	.5704202
w37	-.2790308	.2777571	-1.00	0.319	-.8339144	.2758528
w38	-1.300405	.3884478	-3.35	0.001	-2.076419	-.5243914
w39	.0520897	.3087953	0.17	0.867	-.5647998	.6689791
w40	-.2861638	.2877138	-0.99	0.324	-.8609381	.2886105
w41	-.5789986	.3057791	-1.89	0.063	-1.189863	.0318654
w42	-.6432762	.3395555	-1.89	0.063	-1.321616	.0350638
w43	-.1967645	.3108262	-0.63	0.529	-.8177111	.4241822
w44	-.5202993	.3014543	-1.73	0.089	-1.122524	.0819249
w45	-.3151835	.3380297	-0.93	0.355	-.9904755	.3601085
w46	-.6083392	.3616318	-1.68	0.097	-1.330782	.1141033
w47	-1.386059	.2835013	-4.89	0.000	-1.952418	-.8196997
w48	-1.137434	.3121758	-3.64	0.001	-1.761077	-.5137913
w49	-1.241023	.3526181	-3.52	0.001	-1.945458	-.5365871
w50	-1.607287	.3472863	-4.63	0.000	-2.301071	-.9135031
w51	-.9703762	.2893231	-3.35	0.001	-1.548366	-.3923868
w52	-.1587337	.3295077	-0.48	0.632	-.8170011	.4995337
_cons	10.27143	.3282694	31.29	0.000	9.615641	10.92723

sigma_u	**1.1291756**
sigma_e	**.9311568**
rho	**.59523048** (fraction of variance due to u_i)

```
54 . coefplot, keep(e*) coeflabels(,labsize(tiny)) vertical xline(35) levels(90) yline(0) ytitle(d
   > 0 e11 e12 e13 e14 e15 e16 e17 e18 e19 e20 e21 e22 e23 e24 e25 e26 e27 e28 e29 e30 e31 e32 e33
   > 4 e55 e56 e57 e58 e59 e60 e61 e62 e63 e64 e65 e66 e67 e68 e69)

55 . * (e)
56 . ssc install parmest
   checking parmest consistency and verifying not already installed...
   all files already exist and are up to date.

57 . parmest, label format(estimate) list(parm label estimate) saving("C:\Users\u1266283\Downloads
```

	parm	label	estimate
1.	e8	-37	.16609963
2.	e9	-36	.04920431
3.	e10	-35	.03250159
4.	e11	-34	.11351847
5.	e12	-33	.1410174
6.	e13	-32	.13217581
7.	e14	-31	-.02061605
8.	e15	-30	-.30851032
9.	e16	-29	.2679701
10.	e17	-28	.26864431
11.	e18	-27	-.02983295
12.	e19	-26	-.01419944
13.	e20	-25	-.12222562
14.	e21	-24	-.17525061
15.	e22	-23	.00263891
16.	e23	-22	.13935983
17.	e24	-21	.15581716
18.	e25	-20	.03600303
19.	e26	-19	.09243998
20.	e27	-18	.24622429
21.	e28	-17	.10584846
22.	e29	-16	-.0788001
23.	e30	-15	.15076889
24.	e31	-14	.23906658
25.	e32	-13	.37862496
26.	e33	-12	.31275424
27.	e34	-11	.1019633
28.	e35	-10	-.10263955
29.	e36	-9	.23062855
30.	e37	-8	.20840926
31.	e38	-7	-.09779328
32.	e39	-6	.0684474
33.	e40	-5	.07098735
34.	e41	-4	.14322943
35.	e43	-2	-.49019101
36.	e44	-1	-.77733946
37.	e45	0	-.64647597
38.	e46	1	-1.0409113
39.	e47	2	-1.0225621
40.	e48	3	-1.0449163
41.	e49	4	-1.2023474
42.	e50	5	-1.1489273
43.	e51	6	-1.1152513
44.	e52	7	-1.0322607

45.	e53		8	-1.1259318
46.	e54		9	-.83181309
47.	e55		10	-1.0275513
48.	e56		11	-.96326838
49.	e57		12	-.80234893
50.	e58		13	-.87088841
51.	e59		14	-.94482096
52.	e60		15	-.94104272
53.	e61		16	-.93740293
54.	e62		17	-.65752678
55.	e63		18	-.85398989
56.	e64		19	-.6938821
57.	e65		20	-.7584854
58.	e66		21	-.65393174
59.	e67		22	-.58396413
60.	e68		23	-1.1180057
61.	e69		24	-.78024946
62.	o.e42		-3	0
63.	w2	calendar_week==	-14.0000	-.1458825
64.	w3	calendar_week==	-13.0000	-.19524427
65.	w4	calendar_week==	-12.0000	-.04639365
66.	w5	calendar_week==	-11.0000	.05399941
67.	w6	calendar_week==	-10.0000	-.10004385
68.	w7	calendar_week==	-9.0000	-.25700508
69.	w8	calendar_week==	-8.0000	.22240974
70.	w9	calendar_week==	-7.0000	.0248986
71.	w10	calendar_week==	-6.0000	-.15653134
72.	w11	calendar_week==	-5.0000	-.50896902
73.	w12	calendar_week==	-4.0000	-.54299488
74.	w13	calendar_week==	-3.0000	-.98783298
75.	w14	calendar_week==	-2.0000	-.65557895
76.	w15	calendar_week==	-1.0000	-.60279701
77.	w16	calendar_week==	0.0000	-1.366639
78.	w17	calendar_week==	1.0000	-.30352404
79.	w18	calendar_week==	2.0000	1.0396693
80.	w19	calendar_week==	3.0000	-.54507463
81.	w20	calendar_week==	4.0000	-1.0062064
82.	w21	calendar_week==	5.0000	-1.2276806
83.	w22	calendar_week==	6.0000	-1.1487421
84.	w23	calendar_week==	7.0000	-.92371202
85.	w24	calendar_week==	8.0000	-1.5761616
86.	w25	calendar_week==	9.0000	-.74043195
87.	w26	calendar_week==	10.0000	-.76571734
88.	w27	calendar_week==	11.0000	.28148514
89.	w28	calendar_week==	12.0000	-.43984169
90.	w29	calendar_week==	13.0000	-.72495107
91.	w30	calendar_week==	14.0000	-1.1639705
92.	w31	calendar_week==	15.0000	-.57160186
93.	w32	calendar_week==	16.0000	.89729273
94.	w33	calendar_week==	17.0000	-.02093801
95.	w34	calendar_week==	18.0000	-1.8383506
96.	w35	calendar_week==	19.0000	.14748028
97.	w36	calendar_week==	20.0000	-.01311388
98.	w37	calendar_week==	21.0000	-.27903078
99.	w38	calendar_week==	22.0000	-1.300405
100.	w39	calendar_week==	23.0000	.05208967
101.	w40	calendar_week==	24.0000	-.28616384
102.	w41	calendar_week==	25.0000	-.57899858
103.	w42	calendar_week==	26.0000	-.64327618
104.	w43	calendar_week==	27.0000	-.19676449

105.	**w44**	**calendar_week==**	**28.0000**	**-.52029933**
106.	**w45**	**calendar_week==**	**29.0000**	**-.31518353**
107.	**w46**	**calendar_week==**	**30.0000**	**-.60833922**
108.	**w47**	**calendar_week==**	**31.0000**	**-1.3860587**
109.	**w48**	**calendar_week==**	**32.0000**	**-1.1374342**
110.	**w49**	**calendar_week==**	**33.0000**	**-1.2410228**
111.	**w50**	**calendar_week==**	**34.0000**	**-1.6072873**
112.	**w51**	**calendar_week==**	**35.0000**	**-.9703762**
113.	**w52**	**calendar_week==**	**36.0000**	**-.15873368**
114.	**_cons**		**Constant**	**10.271434**

file C:\Users\u1266283\Downloads\et_coeff.dta saved

```
58 . export excel using "C:\Users\u1266283\Downloads\eventtime.xls", firstrow(variables)
file C:\Users\u1266283\Downloads\eventtime.xls saved

59 .
60 . * IV
61 . * (a)
62 . xtreg residual_weight LetterReceived TreatmentOngoing TreatmentCompleted w2-w52, fe i(route)
```

Fixed-effects (within) regression — Number of obs = **3,340**
Group variable: **route** — Number of groups = **65**

R-sq:
within = **0.4391**
between = **0.0594**
overall = **0.2618**

Obs per group:
min = **47**
avg = **51.4**
max = **52**

F(**54,64**) = **401.46**
corr(u_i, Xb) = **0.0173** — Prob > F = **0.0000**

(Std. Err. adjusted for **65** clusters in route)

residual_weight	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
LetterReceived	-.7014392	.0665634	-10.54	0.000	-.8344149	-.5684636
TreatmentOngoing	-1.183891	.0768031	-15.41	0.000	-1.337323	-1.030459
TreatmentCompleted	-1.239756	.0879275	-14.10	0.000	-1.415411	-1.0641
w2	-.2159022	.1341608	-1.61	0.112	-.4839192	.0521148
w3	-.3035945	.1286503	-2.36	0.021	-.5606031	-.046586
w4	-.0282265	.1514613	-0.19	0.853	-.3308053	.2743523
w5	.0237206	.160677	0.15	0.883	-.2972685	.3447098
w6	-.1759366	.1590902	-1.11	0.273	-.4937559	.1418826
w7	-.3097484	.1705192	-1.82	0.074	-.6503997	.0309029
w8	.2115351	.1235137	1.71	0.092	-.0352119	.458282
w9	-.0620561	.1416223	-0.44	0.663	-.3449791	.2208669
w10	-.22821	.1603455	-1.42	0.160	-.548537	.092117
w11	-.5434838	.1737616	-3.13	0.003	-.8906125	-.1963551
w12	-.5465607	.1629015	-3.36	0.001	-.8719939	-.2211275
w13	-.9971414	.2047268	-4.87	0.000	-1.40613	-.5881527
w14	-.7133892	.1498941	-4.76	0.000	-1.012837	-.4139412
w15	-.6435026	.1509808	-4.26	0.000	-.9451213	-.3418838
w16	-1.343	.2201796	-6.10	0.000	-1.782859	-.9031406
w17	-.3448169	.199291	-1.73	0.088	-.7429465	.0533126
w18	.9502438	.1780443	5.34	0.000	.5945595	1.305928
w19	-.526391	.15153	-3.47	0.001	-.8291069	-.2236751
w20	-.9622339	.1476884	-6.52	0.000	-1.257275	-.6671924
w21	-1.242957	.1359566	-9.14	0.000	-1.514562	-.9713526
w22	-1.190391	.1474362	-8.07	0.000	-1.484929	-.8958533
w23	-.9181696	.1589771	-5.78	0.000	-1.235763	-.6005763
w24	-1.552939	.1622523	-9.57	0.000	-1.877075	-1.228802
w25	-.6436489	.1407403	-4.57	0.000	-.9248099	-.3624878
w26	-.6825044	.1487462	-4.59	0.000	-.9796591	-.3853497
w27	.2987264	.1669554	1.79	0.078	-.0348054	.6322582
w28	-.3849659	.1678932	-2.29	0.025	-.7203711	-.0495607
w29	-.631358	.1420524	-4.44	0.000	-.9151402	-.3475758
w30	-1.063773	.1574017	-6.76	0.000	-1.378219	-.7493267
w31	-.5455158	.2876466	-1.90	0.062	-1.120156	.0291243

w32	.9667174	.2005766	4.82	0.000	.5660197	1.367415
w33	.1008913	.1616351	0.62	0.535	-.2220118	.4237945
w34	-1.702747	.2594483	-6.56	0.000	-2.221055	-1.18444
w35	.2109589	.2162868	0.98	0.333	-.2211236	.6430414
w36	.031882	.1992953	0.16	0.873	-.3662562	.4300202
w37	-.1246847	.1638486	-0.76	0.449	-.4520099	.2026405
w38	-1.08726	.271895	-4.00	0.000	-1.630433	-.5440876
w39	.1616259	.2137974	0.76	0.452	-.2654834	.5887352
w40	-.1921555	.1563673	-1.23	0.224	-.5045351	.120224
w41	-.3844146	.1505625	-2.55	0.013	-.6851978	-.0836314
w42	-.4215346	.1689156	-2.50	0.015	-.7589824	-.0840869
w43	-.0504577	.1644837	-0.31	0.760	-.3790517	.2781363
w44	-.3516888	.158951	-2.21	0.031	-.6692299	-.0341478
w45	-.1148578	.1801346	-0.64	0.526	-.474718	.2450025
w46	-.3374235	.1684991	-2.00	0.049	-.6740392	-.0008078
w47	-1.167521	.1679936	-6.95	0.000	-1.503126	-.8319148
w48	-.9549053	.1874077	-5.10	0.000	-1.329295	-.5805153
w49	-1.013377	.1657462	-6.11	0.000	-1.344493	-.6822612
w50	-1.281685	.1735803	-7.38	0.000	-1.628451	-.9349184
w51	-.7012489	.1959474	-3.58	0.001	-1.092699	-.309799
w52	.072039	.1898849	0.38	0.706	-.3072997	.4513778
_cons	10.39345	.1270781	81.79	0.000	10.13958	10.64731
sigma_u	1.1231946					
sigma_e	.93419248					
rho	.59109632	(fraction of variance due to u_i)				

63 . xtreg residual_weight LetterReceived TreatmentOngoing TreatmentCompleted w2-w52, fe i(route)

Fixed-effects (within) regression — Number of obs = 3,340
Group variable: route — Number of groups = 65

R-sq:
within = 0.4391
between = 0.0594
overall = 0.2618

Obs per group:
min = 47
avg = 51.4
max = 52

F(54,3221) = 46.70
corr(u_i, Xb) = 0.0173 — Prob > F = 0.0000

residual_weight	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
LetterReceived	-.7014392	.0857314	-8.18	0.000	-.8695329	-.5333456
TreatmentOngoing	-1.183891	.073862	-16.03	0.000	-1.328712	-1.03907
TreatmentCompleted	-1.239756	.0823884	-15.05	0.000	-1.401295	-1.078217
w2	-.2159022	.1645197	-1.31	0.190	-.5384762	.1066718
w3	-.3035945	.1645197	-1.85	0.065	-.6261685	.0189794
w4	-.0282265	.165169	-0.17	0.864	-.3520735	.2956206
w5	.0237206	.1658362	0.14	0.886	-.3014345	.3488757
w6	-.1759366	.1651692	-1.07	0.287	-.499784	.1479108
w7	-.3097484	.1645197	-1.88	0.060	-.6323224	.0128256
w8	.2115351	.1651692	1.28	0.200	-.1123123	.5353825
w9	-.0620561	.1645197	-0.38	0.706	-.3846301	.2605179
w10	-.22821	.1645197	-1.39	0.165	-.5507839	.094364
w11	-.5434838	.1646556	-3.30	0.001	-.8663242	-.2206434
w12	-.5465607	.1646556	-3.32	0.001	-.8694011	-.2237203
w13	-.9971414	.1646227	-6.06	0.000	-1.319917	-.6743655
w14	-.7133892	.1659398	-4.30	0.000	-1.038748	-.3880309
w15	-.6435026	.1652782	-3.89	0.000	-.9675637	-.3194415
w16	-1.343	.1652717	-8.13	0.000	-1.667048	-1.018952
w17	-.3448169	.1661687	-2.08	0.038	-.6706241	-.0190098
w18	.9502438	.1654835	5.74	0.000	.6257803	1.274707
w19	-.526391	.1648808	-3.19	0.001	-.8496729	-.2031092
w20	-.9622339	.1655196	-5.81	0.000	-1.286768	-.6376994
w21	-1.242957	.1655196	-7.51	0.000	-1.567492	-.9184227
w22	-1.190391	.1648808	-7.22	0.000	-1.513673	-.8671091
w23	-.9181696	.1657817	-5.54	0.000	-1.243218	-.5931212
w24	-1.552939	.1657817	-9.37	0.000	-1.877987	-1.22789
w25	-.6436489	.1659314	-3.88	0.000	-.9689908	-.318307
w26	-.6825044	.1671904	-4.08	0.000	-1.010315	-.3546942

w27	.2987264	.1671904	1.79	0.074	-.0290839	.6265366
w28	-.3849659	.1671904	-2.30	0.021	-.7127762	-.0571557
w29	-.631358	.1676048	-3.77	0.000	-.959981	-.3027351
w30	-1.063773	.1695609	-6.27	0.000	-1.396231	-.7313145
w31	-.5455158	.1741101	-3.13	0.002	-.8868936	-.2041381
w32	.9667174	.1720614	5.62	0.000	.6293564	1.304078
w33	.1008913	.1707789	0.59	0.555	-.2339551	.4357377
w34	-1.702747	.175175	-9.72	0.000	-2.046213	-1.359281
w35	.2109589	.1728309	1.22	0.222	-.1279107	.5498285
w36	.031882	.1728309	0.18	0.854	-.3069876	.3707516
w37	-.1246847	.174538	-0.71	0.475	-.4669016	.2175321
w38	-1.08726	.1782783	-6.10	0.000	-1.436811	-.7377099
w39	.1616259	.1775553	0.91	0.363	-.1865069	.5097587
w40	-.1921555	.1769504	-1.09	0.278	-.5391023	.1547912
w41	-.3844146	.1791171	-2.15	0.032	-.7356096	-.0332196
w42	-.4215346	.1803741	-2.34	0.020	-.7751942	-.067875
w43	-.0504577	.1803741	-0.28	0.780	-.4041173	.3032019
w44	-.3516888	.1809033	-1.94	0.052	-.7063861	.0030084
w45	-.1148578	.1835085	-0.63	0.531	-.474663	.2449475
w46	-.3374235	.1838535	-1.84	0.067	-.6979051	.0230582
w47	-1.167521	.1828186	-6.39	0.000	-1.525973	-.8090682
w48	-.9549053	.1828186	-5.22	0.000	-1.313358	-.5964528
w49	-1.013377	.1841013	-5.50	0.000	-1.374345	-.6524098
w50	-1.281685	.1841013	-6.96	0.000	-1.642652	-.9207175
w51	-.7012489	.1845748	-3.80	0.000	-1.063145	-.3393528
w52	.072039	.1852012	0.39	0.697	-.2910851	.4351632
_cons	10.39345	.116792	88.99	0.000	10.16445	10.62244
sigma_u	1.1231946					
sigma_e	.93419248					
rho	.59109632	(fraction of variance due to u_i)				

F test that all u_i=0: F(64, 3221) = 73.02 Prob > F = 0.0000

```
64 . * (b)
65 . sort route calendar_week

66 . by route: gen time=sum(TreatmentCompleted)

67 . gen linear_decay=TreatmentCompleted*time

68 . xtreg residual_weight LetterReceived TreatmentOngoing TreatmentCompleted linear_decay w2-w52,
```

Fixed-effects (within) regression Number of obs = 3,340
Group variable: route Number of groups = 65

R-sq: Obs per group:
within = 0.4409 min = 47
between = 0.0553 avg = 51.4
overall = 0.2578 max = 52

F(55,64) = 415.48
corr(u_i, Xb) = 0.0201 Prob > F = 0.0000

(Std. Err. adjusted for 65 clusters in route)

residual_weight	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
LetterReceived	-.6352303	.0676226	-9.39	0.000	-.7703219	-.5001387
TreatmentOngoing	-1.091562	.0877292	-12.44	0.000	-1.266821	-.9163029
TreatmentCompleted	-1.231588	.0867933	-14.19	0.000	-1.404978	-1.058198
linear_decay	.0172106	.0085055	2.02	0.047	.0002189	.0342024
w2	-.2167488	.1341129	-1.62	0.111	-.4846701	.0511725
w3	-.3044411	.1287398	-2.36	0.021	-.5616285	-.0472538
w4	-.0291743	.1514873	-0.19	0.848	-.331805	.2734564
w5	.0240519	.1607289	0.15	0.882	-.2970409	.3451447
w6	-.177248	.1590402	-1.11	0.269	-.4949674	.1404713
w7	-.310595	.1705452	-1.82	0.073	-.6512982	.0301082
w8	.2102236	.1235667	1.70	0.094	-.0366293	.4570766
w9	-.0629027	.1415815	-0.44	0.658	-.3457442	.2199389
w10	-.2290566	.1604871	-1.43	0.158	-.5496664	.0915532

w11	-.5494234	.1737961	-3.16	0.002	-.896621	-.2022257
w12	-.5525003	.1638619	-3.37	0.001	-.8798521	-.2251485
w13	-1.00509	.2045274	-4.91	0.000	-1.413681	-.5964997
w14	-.7203517	.1500463	-4.80	0.000	-1.020104	-.4205998
w15	-.6520294	.1514267	-4.31	0.000	-.9545391	-.3495197
w16	-1.350447	.2207998	-6.12	0.000	-1.791545	-.9093486
w17	-.358101	.1991705	-1.80	0.077	-.7559898	.0397877
w18	.9378715	.1790823	5.24	0.000	.5801135	1.29563
w19	-.536292	.1517182	-3.53	0.001	-.8393839	-.2332001
w20	-.9726304	.1481477	-6.57	0.000	-1.268589	-.6766714
w21	-1.254699	.1361757	-9.21	0.000	-1.526741	-.9826565
w22	-1.204264	.1478074	-8.15	0.000	-1.499543	-.9089845
w23	-.9435522	.1583525	-5.96	0.000	-1.259898	-.6272067
w24	-1.579645	.1630294	-9.69	0.000	-1.905334	-1.253957
w25	-.6705476	.1391681	-4.82	0.000	-.948568	-.3925273
w26	-.722237	.1494931	-4.83	0.000	-1.020884	-.4235901
w27	.256346	.1659083	1.55	0.127	-.0750938	.5877859
w28	-.4299941	.1721253	-2.50	0.015	-.7738539	-.0861342
w29	-.6830524	.1417839	-4.82	0.000	-.9662982	-.3998066
w30	-1.118001	.1602825	-6.98	0.000	-1.438202	-.7977997
w31	-.6041914	.2874424	-2.10	0.039	-1.178424	-.0299593
w32	.9013793	.2027583	4.45	0.000	.4963231	1.306435
w33	.0370581	.1694133	0.22	0.828	-.3013839	.3755001
w34	-1.784217	.2585969	-6.90	0.000	-2.300824	-1.26761
w35	.1210529	.2264699	0.53	0.595	-.3313727	.5734786
w36	-.0659674	.2096238	-0.31	0.754	-.4847391	.3528044
w37	-.2241958	.1773175	-1.26	0.211	-.5784282	.1300366
w38	-1.205804	.2762552	-4.36	0.000	-1.757687	-.6539203
w39	.030576	.2314562	0.13	0.895	-.4318109	.4929628
w40	-.3336261	.181905	-1.83	0.071	-.697023	.0297708
w41	-.5301947	.1722794	-3.08	0.003	-.8743625	-.186027
w42	-.5856467	.1894898	-3.09	0.003	-.9641961	-.2070973
w43	-.2278087	.1895902	-1.20	0.234	-.6065587	.1509413
w44	-.5426792	.1975844	-2.75	0.008	-.9373995	-.1479589
w45	-.3088	.2187594	-1.41	0.163	-.745822	.1282221
w46	-.5507841	.2168139	-2.54	0.014	-.9839197	-.1176486
w47	-1.394832	.2183428	-6.39	0.000	-1.831022	-.9586423
w48	-1.198104	.2424701	-4.94	0.000	-1.682493	-.7137138
w49	-1.267312	.2323032	-5.46	0.000	-1.731391	-.8032334
w50	-1.552831	.2421773	-6.41	0.000	-2.036635	-1.069026
w51	-.9913244	.2534334	-3.91	0.000	-1.497616	-.4850331
w52	-.2346062	.2643906	-0.89	0.378	-.7627871	.2935747
_cons	10.39428	.1272633	81.68	0.000	10.14004	10.64852
sigma_u	1.1293476					
sigma_e	.93284337					
rho	.59443161	(fraction of variance due to u_i)				

```
69 . display .6352303/.0172106
   36.909248

70 . * (c)
71 . gen shortterm=(time<=15)

72 . gen effect_st=TreatmentCompleted*shortterm

73 . gen effect_lt=TreatmentCompleted*(1-shortterm)

74 . xtreg residual_weight LetterReceived TreatmentOngoing effect_st effect_lt w2-w52, fe i(route)

   Fixed-effects (within) regression               Number of obs      =       3,340
   Group variable: route                           Number of groups   =          65

   R-sq:                                           Obs per group:
        within  = 0.4398                                         min =          47
        between = 0.0578                                         avg =        51.4
        overall = 0.2602                                         max =          52

                                                   F(55,64)           =      394.82
   corr(u_i, Xb)  = 0.0193                         Prob > F           =      0.0000
```

(Std. Err. adjusted for **65** clusters in route)

residual_weight	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
LetterReceived	-.6736646	.0652972	-10.32	0.000	-.8041107	-.5432185
TreatmentOngoing	-1.143992	.0796629	-14.36	0.000	-1.303137	-.9848465
effect_st	-1.19496	.1010259	-11.83	0.000	-1.396783	-.9931378
effect_lt	-1.033796	.1913199	-5.40	0.000	-1.416001	-.6515907
w2	-.2162588	.1341564	-1.61	0.112	-.484267	.0517493
w3	-.3039512	.1287232	-2.36	0.021	-.5611053	-.0467971
w4	-.0286382	.1514752	-0.19	0.851	-.3312446	.2739683
w5	.0239327	.1607079	0.15	0.882	-.2971183	.3449837
w6	-.1765414	.1591155	-1.11	0.271	-.4944112	.1413284
w7	-.310105	.1705615	-1.82	0.074	-.6508408	.0306308
w8	.2109303	.1235804	1.71	0.093	-.03595	.4578106
w9	-.0624127	.1416356	-0.44	0.661	-.3453623	.2205369
w10	-.2285666	.1604324	-1.42	0.159	-.5490671	.0919339
w11	-.5459769	.1737958	-3.14	0.003	-.8931738	-.19878
w12	-.5490538	.1634921	-3.36	0.001	-.8756668	-.2224409
w13	-1.000567	.2047552	-4.89	0.000	-1.409613	-.5915217
w14	-.716318	.1501016	-4.77	0.000	-1.01618	-.4164555
w15	-.6472255	.1511129	-4.28	0.000	-.9491082	-.3453427
w16	-1.346173	.2206423	-6.10	0.000	-1.786957	-.9053893
w17	-.3504934	.1992384	-1.76	0.083	-.7485179	.0475311
w18	.9449625	.1788459	5.28	0.000	.5876768	1.302248
w19	-.5332626	.1519896	-3.51	0.001	-.8368967	-.2296285
w20	-.9687978	.1482096	-6.54	0.000	-1.264881	-.672715
w21	-1.249521	.1362503	-9.17	0.000	-1.521712	-.9773297
w22	-1.197263	.1478917	-8.10	0.000	-1.49271	-.9018149
w23	-.9293142	.1589645	-5.85	0.000	-1.246882	-.611746
w24	-1.564083	.1630965	-9.59	0.000	-1.889906	-1.238261
w25	-.6570355	.1402301	-4.69	0.000	-.9371774	-.3768935
w26	-.700164	.1492646	-4.69	0.000	-.9983543	-.4019737
w27	.2810668	.1674226	1.68	0.098	-.0533982	.6155318
w28	-.4026255	.170206	-2.37	0.021	-.742651	-.0626001
w29	-.6508829	.1418178	-4.59	0.000	-.9341965	-.3675694
w30	-1.088324	.1590002	-6.84	0.000	-1.405963	-.7706845
w31	-.5702525	.2886003	-1.98	0.052	-1.146798	.0062928
w32	.9421711	.2032533	4.64	0.000	.5361259	1.348216
w33	.0737215	.166175	0.44	0.659	-.2582511	.4056942
w34	-1.74507	.2614544	-6.67	0.000	-2.267385	-1.222755
w35	.1671188	.2227324	0.75	0.456	-.2778402	.6120779
w36	-.0119581	.2070831	-0.06	0.954	-.4256541	.4017379
w37	-.1711434	.1715644	-1.00	0.322	-.5138826	.1715959
w38	-1.136288	.2745143	-4.14	0.000	-1.684694	-.587883
w39	.1108907	.2223637	0.50	0.620	-.3333319	.5551132
w40	-.2552845	.1693843	-1.51	0.137	-.5936686	.0830996
w41	-.4501621	.1639766	-2.75	0.008	-.777743	-.1225813
w42	-.4894187	.1782906	-2.75	0.008	-.8455951	-.1332422
w43	-.1183418	.1739296	-0.68	0.499	-.4658061	.2291226
w44	-.4197377	.1738633	-2.41	0.019	-.7670695	-.072406
w45	-.2080141	.1988859	-1.05	0.300	-.6053344	.1893062
w46	-.4327558	.1920203	-2.25	0.028	-.8163605	-.0491511
w47	-1.261885	.1887789	-6.68	0.000	-1.639014	-.884756
w48	-1.074064	.2213235	-4.85	0.000	-1.516209	-.6319197
w49	-1.132913	.2055017	-5.51	0.000	-1.54345	-.722376
w50	-1.401221	.2079462	-6.74	0.000	-1.816641	-.9858003
w51	-.8216377	.2113406	-3.89	0.000	-1.243839	-.3994364
w52	-.0726042	.2239054	-0.32	0.747	-.5199066	.3746981
_cons	10.3938	.1271387	81.75	0.000	10.13981	10.64779
sigma_u	1.1256578					
sigma_e	.93375411					
rho	.59238156	(fraction of variance due to u_i)				

```
75 . display (-1.033796--1.19496)/(-1.19496)
   -.13486979

76 . test effect_st==effect_lt

    ( 1)  effect_st - effect_lt = 0

          F(  1,    64) =    2.02
               Prob > F =    0.1599

77 .
   end of do-file

78 .
```