Econometrics Assignment 6a

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II.

a)

The mean of the outcome variable in week 34 is 7.89 Command & output:

. sum residual_weight if calendar week==34

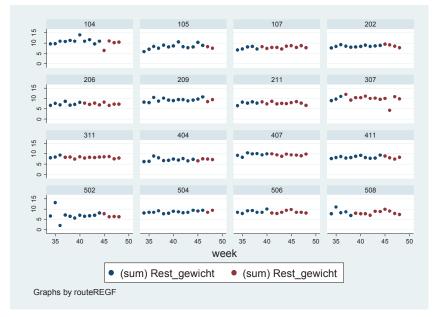
Variable	Obs	Mean	Std. Dev.	Min	Max
residual_w~t	55	7.887636	1.082052	5.66	10.26

b) The minimum value of the time in between treatments is equal to 7 weeks. The maximum value of the time in between treatments is equal to 35 weeks. Command & output:

. sum TimeElapsed

Variable	Obs	Mean	Std. Dev.	Min	Max
TimeElapsed	825	22.41818	6.361932	7	35

c) Command: graph twoway (scatter residual_weight calendar_week if RepTreatmentOngoing==0&RepTreatmentCompleted==0) (scatter residual_weight calendar_week if RepTreatmentOngoing==1| RepTreatmentCompleted==1) if TimeElapsed>25, by(route) Output:



The scatter graph shows no clear sign of anything going on at all as of the date of the repeated treatment.

III.

a) Command & output:

. xtreg residua		Treatment i.	calendar	_week, fe	i(route) clu	ster(route)
Fixed-effects	(within) regre	ession		Number of	obs =	825
Group variable	_			Number of	groups =	55
R-sq:				Obs per g	roup:	
within =					min =	15
between =					avg =	15.0
overall =	0.0575				max =	15
				F(15,54)	=	16.36
corr(u_i, Xb)	= -0 0110			Prob > F	=	0.0000
coll (a_1, no)	0.0110			1100 / 1		0.0000
		(Std.	Err. ad	justed for	55 clusters	in route)
residual_we~t	Coef.	Robust Std. Err.	t	P> t	[95% Conf.	Interval]
RepTreatment	2196485	.1040657	-2.11	0.039	4282877	0110094
calendar week						
_ 35	.4847273	.2045601	2.37	0.021	.074609	.8948455
36	1.181091	.2356929	5.01	0.000	.708555	1.653627
37	1.087209	.1322987	8.22	0.000	.8219659	1.352452
38	.8072088	.1334875	6.05	0.000	.5395825	1.074835
39	.8173267	.1309538	6.24	0.000	.5547802	1.079873
40	1.326781	.1443665	9.19	0.000	1.037344	1.616219
41	1.142717	.1457799	7.84	0.000	.8504462	1.434989
42	.6834447	.1229308	5.56	0.000	.4369832	.9299062
43	.9346535	.1266024	7.38	0.000	.680831	1.188476
44	1.233563	.1347114	9.16	0.000	.9634825	1.503643
45	1.625499	.1962734	8.28	0.000	1.231994	2.019003
46	1.184771	.2038179	5.81	0.000	.7761412	1.593402
47	.9429213	.1568108	6.01	0.000	.6285346	1.257308
48	.7720122	.1370651	5.63	0.000	.4972131	1.046811
_cons	7.887636	.0698455	112.93	0.000	7.747605	8.027668
sigma u	1.0697362					
sigma e	.93856932					
2.5						

.56503482 (fraction of variance due to u_i)

As can be concluded from the table the ATE is estimated to be $-\ 0.22$.

If the same regression is ran without clustering the standard errors, the standard error of the treatment variable rises from 0.1041 to 0.1188.

Command & output:

. margins, eydx(RepTreatment)

Average marginal effects Number of obs = 825

Model VCE : Robust

Expression : Linear prediction, predict()

ey/dx w.r.t. : RepTreatment

		Delta-method Std. Err.		P> z	[95% Conf.	Interval]
RepTreatment	0252123	.0119466	-2.11	0.035	0486271	0017974

From these results we can conclude that being subjected to treatment leads to a 2.5% decrease in the residual weight.

b) Commands and output of large tables can be found in the log-file below.

We assumed that dydx was a typo and we used eydx instead, this indeed leads to approximately the same results as found under a) (a 2.6% decrease).

Commands & output:

. margins, eydx(RepTreatment)

Average marginal effects Number of obs = 825

Model VCE : Robust

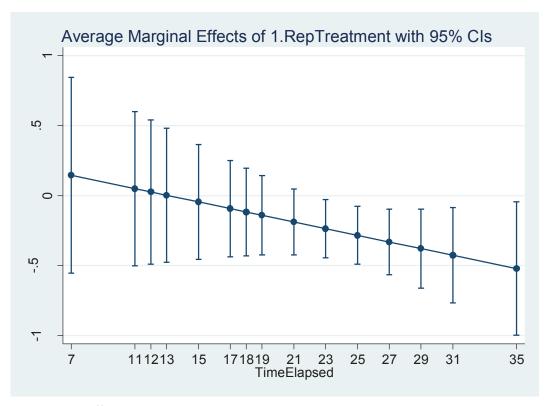
Expression : Linear prediction, predict()

ey/dx w.r.t. : 1.RepTreatment

	Delta-method					
	ey/dx	Std. Err.	t	P> t	[95% Conf.	Interval]
1.RepTreatment	0262506	.0123644	-2.12	0.038	0510398	0014614

Note: ey/dx for factor levels is the discrete change from the base level.

The interaction term may predict but cannot be concluded to cause the treatment effect.



The marginal effects plot suggests that the greater the time elapsed since the last treatment has ended, the greater the negative marginal treatment effect of the repeated treatment i.e. the more the residual_weight decreases when subjected to the repeated treatment. This can be seen from the negative slope of the marginal effects plot.

The marginal effects line up nicely because of the linear relationship between the value of the time elapsed and the marginal effect of the repeated treatment. This can be seen when taking the first order derivative of the estimation equation with respect to the repeated treatment variable.

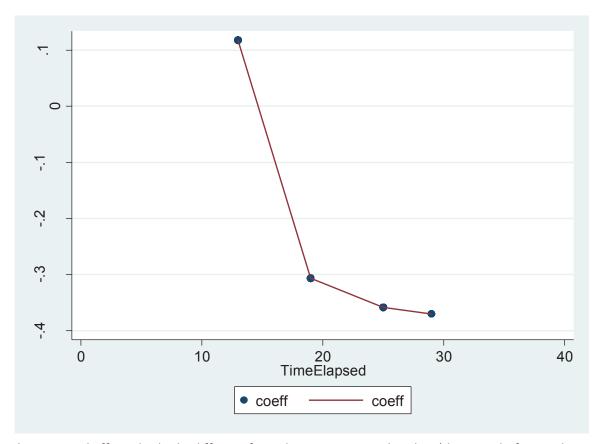
d) Regression command and output:

. xtreg residual_weight RepTreatment_quick RepTreatment_medium1 RepTreatment_medium2 Re
> pTreatment_slow i.calendar_week, fe i(route) cluster(route)

Fixed-effects (within) regression	Number of obs	= 825
Group variable: route	Number of groups	= 55
R-sq:	Obs per group:	
within $= 0.1419$	min	= 15
between = 0.0047	avg	= 15.0
overall = 0.0510	max	= 15
	F(18,54)	= 16.03
corr(u i, Xb) = -0.0547	Prob > F	= 0.0000

(Std. Err. adjusted for 55 clusters in route)

residual_weight	Coef.	Robust Std. Err.	t	P> t	[95% Conf.	Interval]
RepTreatment_quick	.1177308	.2964861	0.40	0.693	4766881	.7121496
RepTreatment_medium1	3068546	.1442285	-2.13	0.038	5960153	0176939
RepTreatment_medium2	358484	.1443722	-2.48	0.016	6479327	0690352
RepTreatment_slow	3706549	.1514551	-2.45	0.018	6743041	0670057
calendar week						
35	.4847273	.2049404	2.37	0.022	.0738465	.8956081
36	1.181091	.2361312	5.00	0.000	.7076764	1.654505
37	1.074063	.1365077	7.87	0.000	.8003815	1.347744
38	.794063	.1345275	5.90	0.000	.5243515	1.063774
39	.8195517	.1329858	6.16	0.000	.5529312	1.086172
40	1.329006	.142134	9.35	0.000	1.044045	1.613968
41	1.141119	.1498751	7.61	0.000	.8406374	1.4416
42	.6818461	.1224603	5.57	0.000	.4363279	.9273642
43	.9112506	.1277635	7.13	0.000	.6551001	1.167401
44	1.21016	.136903	8.84	0.000	.9356856	1.484634
45	1.62353	.1966725	8.25	0.000	1.229225	2.017835
46	1.182803	.2024983	5.84	0.000	.7768182	1.588788
47	.9455796	.1563869	6.05	0.000	.6320428	1.259116
48	.7746705	.1374764	5.63	0.000	.4990469	1.050294
_cons	7.887636	.0722353	109.19	0.000	7.742813	8.032459
sigma_u sigma_e rho	1.0814731 .93564324 .57192032	(fraction	of varia	nce due t	co u_i)	



This marginal effect plot looks different from the one generated under c) because before making this graph, four bins have been created: quick, medium1, medium2 and slow. Using these bins, the values on the y-axis give the average marginal effect per bin.

The marginal effect plot can help policymakers make the decision of how much time to leave between the first treatment and the repeated treatment. We can see form the plot that the more time has elapsed, the greater the marginal average treatment effect. We would go for the time elapsed in the slowest bin as this indicates the largest marginal treatment effect i.e. it can target its treatment.

Statistics/Data Analysis

1 . log using "M:\Master\Methods Econometrics I\Log-file CA6a.smcl"

name: <unnamed>

log: M:\Master\Methods Econometrics I\Log-file CA6a.smcl

log type: smcl

opened on: 6 Oct 2017, 16:22:34

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

3 . * Computer Assignment 6a

5 . * (I)

6 . * (a)

7 . use "C:\Users\u1266283\Downloads\heterogeneity.dta", clear

8 . xtset route calendar_week

panel variable: route (strongly balanced)
time variable: calendar_week, 34 to 48
delta: 1 unit

9 . 10 . * (II) 11 . * (a)

12 . sum residual_weight if calendar_week==34

residual w~t		7 007626	1 082052	5 66	10.26
Variable	Obs	Mean	Std. Dev.	Min	Max

13 . * (b)

14 . sum TimeElapsed

TimeElapsed	825	22.41818	6.361932	7	35
Variable	Obs	Mean	Std. Dev.	Min	Max

15 . * (c)

16 . graph twoway (scatter residual_weight calendar_week if RepTreatmentOngoing==0&RepTreatmentCom > atmentCompleted==1) if TimeElapsed>25, by(route)

17 .

18 . * (III)

19 . * (a)
20 . xtreg residual_weight RepTreatment i.calendar_week, fe i(route) cluster(route)

Fixed-effects (within) regression Group variable: route	Number of obs Number of groups		825 55
<pre>R-sq: within = 0.1331 between = 0.0016 overall = 0.0575</pre>	Obs per group: min avg max	=	15 15.0 15
corr(u_i, Xb) = -0.0110	F(15,54) Prob > F	=	16.36 0.0000

(Std. Err. adjusted for **55** clusters in route)

residual_we~t	Coef.	Robust Std. Err.	t	P> t	[95% Conf.	Interval]
RepTreatment	2196485	.1040657	-2.11	0.039	4282877	0110094
calendar_week	4045050	0045601	0.05		074600	0040455
35	.4847273	.2045601	2.37	0.021	.074609	.8948455
36	1.181091	.2356929	5.01	0.000	.708555	1.653627
37	1.087209	.1322987	8.22	0.000	.8219659	1.352452
38	.8072088	.1334875	6.05	0.000	.5395825	1.074835
39	.8173267	.1309538	6.24	0.000	.5547802	1.079873
40	1.326781	.1443665	9.19	0.000	1.037344	1.616219
41	1.142717	.1457799	7.84	0.000	.8504462	1.434989

cons sigma_u sigma_e rho	7.887636 1.0697362 .93856932 .56503482	.0698455 (fraction	of varia	0.000	7.747605 	8.027668
48	.7720122	.1370651	5.63	0.000	.4972131	1.046811
47	.9429213	.1568108	6.01	0.000	.6285346	1.257308
46	1.184771	.2038179	5.81	0.000	.7761412	1.593402
45	1.625499	.1962734	8.28	0.000	1.231994	2.019003
4 4	1.233563	.1347114	9.16	0.000	.9634825	1.503643
43	. 9346535	.1266024	7.38	0.000	.680831	1.188476
42	.6834447	.1229308	5.56	0.000	.4369832	.9299062

21 . margins, eydx(RepTreatment)

Average marginal effects Number of obs = 825

Model VCE : Robust

Expression : Linear prediction, predict()
ey/dx w.r.t. : RepTreatment

		Delta-method Std. Err.	Z	P> z	[95% Conf.	Interval]
RepTreatment	0252123	.0119466	-2.11	0.035	0486271	0017974

22 . xtreg residual_weight RepTreatment i.calendar_week, fe i(route)

Fixed-effects (within) regression Group variable: route	Number of obs Number of groups	= = = = = = = = = = = = = = = = = = = =	825 55
R-sq:	Obs per group:		
within = 0.1331	min	=	15
between = 0.0016	avg	=	15.0
overall = 0.0575	max	=	15
	F (15,755)	=	7.73
$corr(u_i, Xb) = -0.0110$	Prob > F	=	0.0000

residual_we~t	Coef.	Std. Err.	t	P> t	[95% Conf.	Interval]
RepTreatment	2196485	.1187927	-1.85	0.065	4528518	.0135547
calendar_week						
35	.4847273	.1789781	2.71	0.007	.1333733	.8360812
36	1.181091	.1789781	6.60	0.000	.8297369	1.532445
37	1.087209	.1802767	6.03	0.000	.7333057	1.441112
38	.8072088	.1802767	4.48	0.000	.4533057	1.161112
39	.8173267	.1841173	4.44	0.000	.455884	1.178769
40	1.326781	.1841173	7.21	0.000	.9653385	1.688224
41	1.142717	.1903463	6.00	0.000	.7690465	1.516388
42	.6834447	.1903463	3.59	0.000	.3097738	1.057116
43	.9346535	.1987391	4.70	0.000	.5445066	1.3248
4 4	1.233563	.1987391	6.21	0.000	.8434157	1.623709
45	1.625499	.2090353	7.78	0.000	1.215139	2.035858
46	1.184771	.2090353	5.67	0.000	.774412	1.595131
47	.9429213	.2148136	4.39	0.000	.5212183	1.364624
48	.7720122	.2148136	3.59	0.000	.3503092	1.193715
_cons	7.887636	.1265567	62.32	0.000	7.639192	8.136081
sigma_u sigma_e	1.0697362					

23 . * (b)

24 . reg residual_weight i.RepTreatment##c.TimeElapsed i.calendar_week i.route, cluster(route) note: 512.route omitted because of collinearity

Root MSE

(Std. Err. adjusted for **55** clusters in route)

.93654

		() ()	. 211. 00			in route)
		Robust	_			
residual_weight	Coef.	Std. Err.	t	P> t	[95% Conf.	Interval]
1.RepTreatment	.3118539	.4822727	0.65	0.521	6550446	1.278752
TimeElapsed	.1124518	.009412	11.95	0.000	.0935819	.1313217
RepTreatment#c.TimeElapsed						
1	0238263	.0196146	-1.21	0.230	0631513	.0154987
calendar_week						
35	.4847273	.2118895	2.29	0.026	.0599144	. 9095402
36	1.181091	.2441379	4.84	0.000	.691624	1.670558
37	1.074614	.1400283	7.67	0.000	.793874	1.355354
38	.7946139	.1394755	5.70	0.000	.5149824	1.074245
39	.8124976	.1387798	5.85	0.000	.5342608	1.090734
40	1.321952	.1485578	8.90	0.000	1.024112	1.619793
41	1.139156	.1532918	7.43	0.000	.8318243	1.446487
42	. 6798831	.1266379	5.37	0.000	. 4259895	. 933776
43	.9132986	.1337287	6.83	0.000	.6451886	1.181409
44	1.212208	.1416117	8.56	0.000	. 9282933	1.496122
45	1.620574	.202232	8.01	0.000	1.215123	2.026024
46	1.179846	.2102106	5.61	0.000	.7583994	1.601293
47	. 9455613	.1619552	5.84	0.000	.6208607	1.270262
48	.7746522	.1422769	5.44	0.000	.4894043	1.0599
route						
103	-3.042262	.047876	-63.54	0.000	-3.138248	-2.94627
104	.1272273	.078517	1.62	0.111	0301899	.284644
105	-1.522732	.0750226	-20.30	0.000	-1.673143	-1.37232
106	1.233734	.031387	39.31	0.000	1.170807	1.29666
107	-1.755207	.0363132	-48.34	0.000	-1.828011	-1.682404
108	1.876374	.0818692	22.92	0.000	1.712236	2.040512
109	-2.477648	.0103986	-238.27	0.000	-2.498496	-2.456
110	.3837704	.027726	13.84	0.000	.3281831	. 4393578
111	.9060447	.0209246	43.30	0.000	.8640933	.947996
113	0102703	.0181566	-0.57	0.574	046672	.026131
202	-1.437714	.0649819	-22.12	0.000	-1.567995	-1.30743
203	1.523689	.0104623	145.64	0.000	1.502713	1.54466
204	2822623	.047876	-5.90	0.000	3782479	186276
205	1.568603	.1094333	14.33	0.000	1.349203	1.788004
206	-2.505244	.0418493	-59.86	0.000	-2.589147	-2.421343
207	2.291775	.0408523	56.10	0.000	2.209871	2.373679
208	-1.202581	.0277274	-43.37	0.000	-1.258171	-1.14699
209	558732	.0750226	-7.45	0.000	7091432	4083208
210	1.395685	.0103986	134.22	0.000	1.374837	1.416533
211	-1.877874	.0363132	-51.71	0.000	-1.950677	-1.8050
213	2592846	.0376529	-6.89	0.000	334774	1837952
302	1.031378	.0209246	49.29	0.000	.9894266	1.073329
303	1.107067	.031387	35.27	0.000	1.04414	1.169994
3 0 4	1.110895	.0490772	22.64	0.000	1.012501	1.209289
305	. 6552339	.0733683	8.93	0.000	.5081393	.8023284
306	1.583463	.0479986	32.99	0.000	1.487232	1.679695
307	.4047888	.0313834	12.90	0.000	.3418688	.4677087
308	1.196711	.0209246	57.19	0.000	1.15476	1.238663
310	.671063	.0181566	36.96	0.000	.6346613	.7074648
311	-1.116545	.0313834	-35.58	0.000	-1.179465	-1.053625
312	2782703	.0181566	-15.33	0.000	314672	2418685
313	-1.250266	.031387	-39.83	0.000	-1.313193	-1.187339
			22.00			
402	7733333	1.46e-13	-5.3e+12	0.000	7733333	7733333

_cons	5.669867	.2170027	26.13	0.000	5.234803	6.104931
512	0	(omitted)				
511	.1881442	.0544697	3.45	0.001	.078939	.2973494
510	.7586667	1.46e-13	5.2e+12	0.000	.7586667	.7586667
509	896315	.0103986	-86.20	0.000	9171629	8754671
508	-1.303207	.0363132	-35.89	0.000	-1.376011	-1.230404
507	1.062437	.027726	38.32	0.000	1.00685	1.118024
506	-1.221244	.0418493	-29.18	0.000	-1.305147	-1.137341
505	9475996	.031387	-30.19	0.000	-1.010527	8846725
504	-1.189399	.0750226	-15.85	0.000	-1.33981	-1.038987
503	2232032	.0479986	-4.65	0.000	3194345	1269719
502	-3.079047	.0649819	-47.38	0.000	-3.209328	-2.948766
413	.0707521	.0277274	2.55	0.014	.015162	.1263421
412	-1.189189	.0544697	-21.83	0.000	-1.298394	-1.079984
411	-1.250655	.0541453	-23.10	0.000	-1.359209	-1.1421
409	3382703	.0181566	-18.63	0.000	374672	3018685
408	9776323	.0634224	-15.41	0.000	-1.104786	8504781
407	3585773	.0418493	-8.57	0.000	4424801	2746745
406	-1.236	2.15e-13	-5.7e+12	0.000	-1.236	-1.236
405	.1117704	.027726	4.03	0.000	.0561831	.1673578
404	-3.235439	.078517	-41.21	0.000	-3.392857	-3.078022

25 . margins, eydx(RepTreatment)

825 Average marginal effects Number of obs

Model VCE : Robust

Expression : Linear prediction, predict()
ey/dx w.r.t. : 1.RepTreatment

		Delta-method Std. Err.		P> t	[95% Conf.	Interval]
1.RepTreatment	0262506	.0123644	-2.12	0.038	0510398	0014614

Note: ey/dx for factor levels is the discrete change from the base level.

26 . margins, over(TimeElapsed) dydx(RepTreatment)

Number of obs = 825 Average marginal effects

Model VCE : Robust

Expression : Linear prediction, predict()
dy/dx w.r.t. : 1.RepTreatment

: TimeElapsed over

	1	Delta-method				
	dy/dx	Std. Err.	t	P> t	[95% Conf.	. Interval
1.RepTreatment						
TimeElapsed						
7	.1450698	.3492447	0.42	0.680	5551238	.8452633
11	.0497645	.275121	0.18	0.857	5018199	.6013489
12	.0259382	.2569925	0.10	0.920	4893008	.5411772
13	.0021119	.2390988	0.01	0.993	4772523	.4814761
15	0455407	.2042615	-0.22	0.824	4550603	.3639789
17	0931933	.1713334	-0.54	0.589	4366962	.250309
18	1170196	.1559665	-0.75	0.456	4297136	.1956744
19	1408459	.1416525	-0.99	0.325	424842	.1431502
21	1884985	.1177012	-1.60	0.115	4244751	.047478
23	2361512	.1035354	-2.28	0.027	4437271	0285752
25	2838038	.1032641	-2.75	0.008	4908357	0767718
27	3314564	.1169839	-2.83	0.006	5659949	0969178
29	379109	.1406587	-2.70	0.009	6611126	0971054
31	4267616	.1701833	-2.51	0.015	7679586	0855646
35	5220668	.2378045	-2.20	0.032	9988362	045297

Note: dy/dx for factor levels is the discrete change from the base level.

27 . * (c)

28 . marginsplot

Variables that uniquely identify margins: TimeElapsed

29 . * (d)

30 . gen quick=(TimeElapsed<=17)</pre>

31 . gen medium1=(TimeElapsed>17&TimeElapsed<=23)</pre>

32 . gen medium2=(TimeElapsed>23&TimeElapsed<=27)</pre>

33 . gen slow=(TimeElapsed>27)

34 . gen RepTreatment_quick=RepTreatment*quick

35 . gen RepTreatment_medium1=RepTreatment*medium1

36 . gen RepTreatment_medium2=RepTreatment*medium2

37 . gen RepTreatment_slow=RepTreatment*slow

38 . xtreg residual_weight RepTreatment_quick RepTreatment_medium1 RepTreatment_medium2 RepTreatme

Fixed-effects (within) regression	Number of obs	=	825
Group variable: route	Number of groups	=	55
R-sq:	Obs per group:		
within = 0.1419	mi	n =	15
between = 0.0047	av	g =	15.0
overall = 0.0510	ma	x =	15
	F (18,54)	=	16.03
$corr(u_i, Xb) = -0.0547$	Prob > F	=	0.0000

(Std. Err. adjusted for **55** clusters in route)

	g . c	Robust		D. 11.1	1050 a c	T
residual_weight	Coef.	Std. Err.	t	P> t	[95% Conf.	Interval
RepTreatment_quick	.1177308	.2964861	0.40	0.693	4766881	.7121496
RepTreatment_medium1	3068546	.1442285	-2.13	0.038	5960153	0176939
RepTreatment_medium2	358484	.1443722	-2.48	0.016	6479327	0690352
RepTreatment_slow	3706549	.1514551	-2.45	0.018	6743041	0670057
calendar_week						
35	.4847273	.2049404	2.37	0.022	.0738465	.8956081
36	1.181091	.2361312	5.00	0.000	.7076764	1.654505
37	1.074063	.1365077	7.87	0.000	.8003815	1.347744
38	.794063	.1345275	5.90	0.000	.5243515	1.063774
39	.8195517	.1329858	6.16	0.000	.5529312	1.086172
40	1.329006	.142134	9.35	0.000	1.044045	1.613968
41	1.141119	.1498751	7.61	0.000	.8406374	1.4416
42	.6818461	.1224603	5.57	0.000	. 4363279	.9273642
43	.9112506	.1277635	7.13	0.000	.6551001	1.167401
4 4	1.21016	.136903	8.84	0.000	. 9356856	1.484634
45	1.62353	.1966725	8.25	0.000	1.229225	2.017835
46	1.182803	.2024983	5.84	0.000	.7768182	1.588788
47	. 9455796	.1563869	6.05	0.000	.6320428	1.259116
48	.7746705	.1374764	5.63	0.000	.4990469	1.050294
_cons	7.887636	.0722353	109.19	0.000	7.742813	8.032459
sigma_u	1.0814731					
sigma_e	. 93564324					
rho	.57192032	(fraction	of varia	nce due t	o u_i)	

- 39 . * (e)
- 40 . gen coeff=.
 (825 missing values generated)
- 41 . replace coeff=_b[RepTreatment_quick] if TimeElapsed==13
 (45 real changes made)
- 42 . replace coeff=_b[RepTreatment_medium1] if TimeElapsed==19 (45 real changes made)
- 43 . replace coeff=_b[RepTreatment_medium2] if TimeElapsed==25
 (90 real changes made)
- 44 . replace coeff=_b[RepTreatment_slow] if TimeElapsed==29 (90 real changes made)
- 45 . sort coeff
- 46 . graph twoway (scatter coeff TimeElapsed) (line coeff TimeElapsed)
- 47 . end of do-file
- 48 .