

```

-----
name: <unnamed> log:

. /* To demonstrate use of 2SLS */
.
. * File 1996 Tanzania DHS
.
. use fac196_3new
.
. *****
. /* Case III: equation of interest is ideal number of children (idealnum - continuous variable) which
depends on whether the person heard a FP message (fpmess - dichotomoes or binary variable), which is
potentially endogenous */
.
. *****
. tab idealnum

```

idealnum	Freq.	Percent	Cum.
0	6	0.10	0.10
1	35	0.57	0.66
2	346	5.59	6.25
3	652	10.53	16.79
4	1,594	25.76	42.54
5	1,047	16.92	59.46
6	1,164	18.81	78.27
7	294	4.75	83.02
8	431	6.96	89.98
9	94	1.52	91.50
10	424	6.85	98.35
11	12	0.19	98.55
12	55	0.89	99.43
13	5	0.08	99.52
14	1	0.02	99.53
15	13	0.21	99.74
16	2	0.03	99.77
20	13	0.21	99.98
30	1	0.02	100.00
Total	6,189	100.00	

```

. tab fpmess

radio, tv, |
paper,     |
poster    |
-----+-----
0 | 3,081  49.78  49.78
1 | 3,108  50.22 100.00
-----+-----
Total | 6,189 100.00

```

```
. * Run the equation of interest (continuous) with no correction for endogeneity of fpmess (binary)
. regress idealnum age20_24 age25_29 age30_34 age35_39 age40_44 age45_49 edu16 edu7 edu8p rural
fpmess,vce(cluster clusterid)
```

```
Linear regression                               Number of obs   =       6,189
                                                F(11, 326)     =       115.46
                                                Prob > F       =       0.0000
                                                R-squared     =       0.2100
                                                Root MSE     =       2.0884
                                                (Std. Err. adjusted for 327 clusters in clusterid)
```

idealnum	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
age20_24	.5789001	.0810929	7.14	0.000	.4193686	.7384316
age25_29	.872731	.0802799	10.87	0.000	.714799	1.030663
age30_34	1.219286	.0937747	13.00	0.000	1.034806	1.403766
age35_39	1.459378	.0981716	14.87	0.000	1.266248	1.652508
age40_44	1.631365	.135163	12.07	0.000	1.365464	1.897267
age45_49	1.779862	.1702003	10.46	0.000	1.445033	2.114691
edu16	-.7862455	.1080629	-7.28	0.000	-.9988341	-.5736568
edu7	-1.135592	.1193183	-9.52	0.000	-1.370323	-.9008613
edu8p	-2.111844	.1500617	-14.07	0.000	-2.407055	-1.816632
rural	.6988568	.093723	7.46	0.000	.5144786	.883235
fpmess	-.4415789	.0711623	-6.21	0.000	-.5815741	-.3015837
_cons	5.003217	.1482413	33.75	0.000	4.711587	5.294847

```
. * We suspect fpmess to be endogeneous
. * Lisradio is the instrument
```

```
. regress fpmess age20_24 age25_29 age30_34 age35_39 age40_44 age45_49 edu16 edu7 edu8p rural hofp5
hcfp5 difp5 lisradio, vce(cluster clusterid)
```

```
Linear regression                               Number of obs   =       6,189
                                                F(14, 326)     =       183.60
                                                Prob > F       =       0.0000
                                                R-squared     =       0.2936
                                                Root MSE     =       .42075
                                                (Std. Err. adjusted for 327 clusters in clusterid)
```

fpmess	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
age20_24	.1226876	.0178575	6.87	0.000	.0875571	.1578182
age25_29	.085437	.0184393	4.63	0.000	.049162	.121712
age30_34	.1508021	.0190991	7.90	0.000	.113229	.1883752
age35_39	.1423371	.0214745	6.63	0.000	.1000911	.1845831
age40_44	.0931331	.0238326	3.91	0.000	.0462481	.1400182
age45_49	.0171092	.0239833	0.71	0.476	-.0300724	.0642908
edu16	.1170048	.0188233	6.22	0.000	.0799744	.1540352
edu7	.206892	.0184089	11.24	0.000	.1706768	.2431073
edu8p	.2468913	.0283675	8.70	0.000	.1910848	.3026977
rural	-.1158171	.0260518	-4.45	0.000	-.167068	-.0645661
hofp5	.0756786	.0277759	2.72	0.007	.021036	.1303211
hcfp5	.0266633	.0200533	1.33	0.185	-.0127869	.0661136
difp5	.0485218	.0168533	2.88	0.004	.0153668	.0816768
lisradio	.3613118	.014433	25.03	0.000	.3329183	.3897053
_cons	.167295	.0334862	5.00	0.000	.1014187	.2331712

```
. * Recommended procedure, using MLE: etregress, formerly treatreg
.
. etregress idealnum age20_24 age25_29 age30_34 age35_39 age40_44 age45_49 edu16 edu7 edu8p rural,
treat(fpmess=age20_24 age25_29 age30_34 age35_39 age40_44 age45_49 edu16 edu7 edu8p rural hofp5 hcfp5
difp5 lisradio) vce(cluster clusterid)
```

```
Iteration 0: log pseudolikelihood = -16607.313
Iteration 1: log pseudolikelihood = -16607.281
Iteration 2: log pseudolikelihood = -16607.281
```

```
Linear regression with endogenous treatment      Number of obs      =      6,189
Estimator: maximum likelihood                  Wald chi2(11)      =     1224.29
Log pseudolikelihood = -16607.281              Prob > chi2        =      0.0000
```

(Std. Err. adjusted for 327 clusters in clusterid)

	Coef.	Robust Std. Err.	z	P> z	[95% Conf. Interval]	

idealnum						
age20_24	.6148451	.0857434	7.17	0.000	.4467911	.7828991
age25_29	.8958568	.0835796	10.72	0.000	.7320437	1.05967
age30_34	1.26281	.0975927	12.94	0.000	1.071532	1.454089
age35_39	1.504551	.0974238	15.44	0.000	1.313604	1.695499
age40_44	1.664493	.1350514	12.32	0.000	1.399797	1.929189
age45_49	1.785396	.1688948	10.57	0.000	1.454368	2.116424
edu16	-.7411063	.1050516	-7.05	0.000	-.9470036	-.5352089
edu7	-1.052007	.115238	-9.13	0.000	-1.27787	-.8261449
edu8p	-1.992946	.1486151	-13.41	0.000	-2.284226	-1.701666
rural	.6215854	.1043853	5.95	0.000	.4169939	.8261769
1.fpmess	-.7178084	.1785856	-4.02	0.000	-1.06783	-.3677871
_cons	5.118784	.1734015	29.52	0.000	4.778923	5.458645

fpmess						
age20_24	.3978946	.0582417	6.83	0.000	.2837429	.5120462
age25_29	.2858459	.06007	4.76	0.000	.1681109	.4035808
age30_34	.4962473	.0635793	7.81	0.000	.3716342	.6208603
age35_39	.4689733	.0715137	6.56	0.000	.3288091	.6091376
age40_44	.308388	.0816903	3.78	0.000	.1482779	.4684981
age45_49	.0359577	.087041	0.41	0.680	-.1346397	.206555
edu16	.3757136	.0620115	6.06	0.000	.2541733	.497254
edu7	.642609	.0598503	10.74	0.000	.5253045	.7599136
edu8p	.8620382	.1152948	7.48	0.000	.6360644	1.088012
rural	-.3720498	.0888233	-4.19	0.000	-.5461403	-.1979593
hofp5	.2759801	.0978606	2.82	0.005	.0841767	.4677834
hcfp5	.0995954	.0695694	1.43	0.152	-.0367582	.235949
difp5	.1537673	.0571361	2.69	0.007	.0417827	.2657519
lisradio	1.024033	.0414044	24.73	0.000	.9428818	1.105184
_cons	-.9969227	.116701	-8.54	0.000	-1.225652	-.768193

/athrho	.0913088	.0494743	1.85	0.065	-.0056591	.1882767
/lnsigma	.7372518	.0303619	24.28	0.000	.6777435	.79676

rho	.0910559	.0490641			-.005659	.1860831
sigma	2.090183	.063462			1.969429	2.218342
lambda	.1903235	.1033479			-.0122347	.3928817

Wald test of indep. eqns. (rho = 0): chi2(1) = 3.41 Prob > chi2 = 0.0650

. * Notice the hat etregress output includes a test of endogeneity: test of independence of error terms of the equations (Ho: Rho = 0)

. * In this case, the probability of the Null Hypothesis being true is 0.065; we cannot reject the null hypothesis at the 5% level, therefore, there is no endogeneity. However, if the test is at the 10% level, we would reject the Null Hypothesis and we conclude there is endogeneity.

```
. test hofp5 hcfp5 difp5 lisradio
```

```
( 1) [fpmess]hofp5 = 0
( 2) [fpmess]hcfp5 = 0
( 3) [fpmess]difp5 = 0
( 4) [fpmess]lisradio = 0
```

chi2(4) = 654.35

```

    Prob > chi2 =      0.0000
. . * You can estimate the std errors using bootstrap
.
. etregress idealnum age20_24 age25_29 age30_34 age35_39 age40_44 age45_49 edu16 edu7 edu8p rural,
treat(fpmess=age20_24 age25_29 age30_34 age35_39 age40_44 age45_49 edu16 edu7 edu8p rural hofp5 hcfp5
difp5 lisradio) vce(bootstrap, reps(500) seed(343488) cluster(cluster))

```

(running etregress on estimation sample)

Bootstrap replications (500)

```

-----+----- 1 ---+--- 2 ---+--- 3 ---+--- 4 ---+--- 5
.....
..... 50
..... 100
..... 150
..... 200
..... 250
..... 350
..... 400
..... 450
..... 500

```

```

Linear regression with endogenous treatment      Number of obs      =      6,189
Estimator: maximum likelihood                  Replications        =      500
                                                Wald chi2(11)       =     1251.41
Log likelihood = -16607.281                    Prob > chi2         =      0.0000
                                                (Replications based on 327 clusters in clusterid)

```

	Observed Coef.	Bootstrap Std. Err.	z	P> z	Normal-based [95% Conf. Interval]	
-----+-----						
idealnum						
age20_24	.6148451	.0915423	6.72	0.000	.4354254	.7942647
age25_29	.8958568	.0868791	10.31	0.000	.7255769	1.066137
age30_34	1.26281	.0992106	12.73	0.000	1.068361	1.45726
age35_39	1.504551	.0984646	15.28	0.000	1.311565	1.697538
age40_44	1.664493	.1387564	12.00	0.000	1.392536	1.936451
age45_49	1.785396	.1608463	11.10	0.000	1.470143	2.100649
edu16	-.7411063	.1062782	-6.97	0.000	-.9494078	-.5328048
edu7	-1.052007	.115542	-9.10	0.000	-1.278465	-.8255491
edu8p	-1.992946	.1519042	-13.12	0.000	-2.290673	-1.695219
rural	.6215854	.1086633	5.72	0.000	.4086092	.8345616
1.fpmess	-.7178084	.1929118	-3.72	0.000	-1.095909	-.3397081
_cons	5.118784	.1743689	29.36	0.000	4.777027	5.460541
-----+-----						
fpmess						
age20_24	.3978946	.0582694	6.83	0.000	.2836886	.5121005
age25_29	.2858459	.0578245	4.94	0.000	.1725118	.3991799
age30_34	.4962473	.0647826	7.66	0.000	.3692758	.6232188
age35_39	.4689733	.0722858	6.49	0.000	.3272957	.610651
age40_44	.308388	.0787639	3.92	0.000	.1540136	.4627624
age45_49	.0359577	.0844848	0.43	0.670	-.1296295	.2015449
edu16	.3757136	.0582644	6.45	0.000	.2615174	.4899098
edu7	.642609	.0591064	10.87	0.000	.5267626	.7584555
edu8p	.8620382	.1217269	7.08	0.000	.6234579	1.100618
rural	-.3720498	.0920444	-4.04	0.000	-.5524534	-.1916461
hofp5	.2759801	.0985825	2.80	0.005	.0827618	.4691983
hcfp5	.0995954	.071394	1.40	0.163	-.0403342	.239525
difp5	.1537673	.0564773	2.72	0.006	.0430738	.2644608
lisradio	1.024033	.0416633	24.58	0.000	.9423744	1.105691
_cons	-.9969227	.1220091	-8.17	0.000	-1.236056	-.7577892
-----+-----						
/athrho	.0913088	.0529554	1.72	0.085	-.0124819	.1950995
/lnsigma	.7372518	.0280442	26.29	0.000	.6822862	.7922173
-----+-----						
rho	.0910559	.0525164			-.0124812	.1926613
sigma	2.090183	.0586174			1.978396	2.208287
lambda	.1903235	.1104483			-.0261511	.4067982
-----+-----						

```

. log close      name: <unnamed>
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