

S. Ettner
Instrumental Variables Example

Question:	How does having a usual source of care influence cancer knowledge among non-elderly adult women?
Sample:	Women aged 18-64
Dependent variable:	Cancer knowledge scale
Regressor of interest:	Whether the respondent has any usual source of care
Possible instruments:	Length of residence in state, whether health is fair or poor, whether has health insurance
Other regressors:	Age, race (black, Asian, other; omit white), Hispanic ethnicity, education (high school, some college, bachelor's degree, graduate degree; vs. less than high school), marital status (married/cohabiting, separated/divorced, widowed; vs. never married), whether children in the household, family size, family income category

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. #delimit;
delimiter now ;
. set more off;

. set memory 100m;
(102400k)

. set matsize 800;

. set level 99;

. use hw4_2.dta, clear;

. global depv knowscor;

. global ereg usoc;

. global iv state hlt_fp ins;

. global control age
>          /* r_white */ r_black r_asian r_other
>          latino
>          /* ed_lths */ ed_hs ed_coll ed_bach ed_grad
>          /* mar_nev */ mar_mar mar_div mar_wid hchild famsize
>          /* finc_50 */ finc_35 finc_25 finc_20 finc_10 finc_5 finc_0;

. global overid 2;

. #delimit cr;
delimiter now cr
.
. * Test endogeneity using a Hausman test
.
. ivreg $depv $control ($ereg = $iv)

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Instrumental variables (2SLS) regression

Source	SS	df	MS	Number of obs =	4635
Model	20.7884412	21	.989925772	F(21, 4613) =	46.70
Residual	126.686746	4613	.027462984	Prob > F	= 0.0000
Total	147.475187	4634	.031824598	R-squared	= 0.1410
				Adj R-squared	= 0.1371
				Root MSE	= .16572

knowscor	Coef.	Std. Err.	t	P> t	[99% Conf. Interval]	
usoc	.1313097	.0522351	2.51	0.012	-.0032946	.265914
age	-.0009117	.0002855	-3.19	0.001	-.0016473	-.000176
r_black	-.0730895	.0078181	-9.35	0.000	-.0932361	-.052943
r_asian	-.079506	.0157949	-5.03	0.000	-.1202077	-.0388043
r_other	-.0322982	.0147325	-2.19	0.028	-.0702623	.0056659
latino	-.0406962	.0090504	-4.50	0.000	-.0640182	-.0173742
ed_hs	.053279	.0074306	7.17	0.000	.0341312	.0724269
ed_coll	.1025753	.0084171	12.19	0.000	.0808853	.1242653
ed_bach	.1413349	.0098974	14.28	0.000	.1158302	.1668395
ed_grad	.1623123	.0111427	14.57	0.000	.1335987	.1910258
mar_mar	.0133401	.0078845	1.69	0.091	-.0069774	.0336576
mar_div	-.0042458	.0088494	-0.48	0.631	-.0270497	.0185581
mar_wid	.0076735	.0143796	0.53	0.594	-.0293811	.0447282
hchild	.0104211	.0067273	1.55	0.121	-.0069146	.0277567
famsize	-.0090906	.0023047	-3.94	0.000	-.0150296	-.0031516

finc_35	.0061095	.0073524	0.83	0.406	-.0128368	.0250557
finc_25	-.0023333	.0075688	-0.31	0.758	-.0218373	.0171708
finc_20	-.0206913	.0094374	-2.19	0.028	-.0450104	.0036278
finc_10	-.0167826	.0106694	-1.57	0.116	-.0442765	.0107113
finc_5	-.0364215	.0100125	-3.64	0.000	-.0622228	-.0106203
finc_0	-.0476887	.0112623	-4.23	0.000	-.0767106	-.0186668
_cons	.477528	.0409779	11.65	0.000	.3719321	.5831239

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Instrumented:  usoc
Instruments:  age r_black r_asian r_other latino ed_hs ed_coll ed_bach ed_grad
              mar_mar mar_div mar_wid hchild famsize finc_35 finc_25 finc_20
              finc_10 finc_5 finc_0 state hlt_fp ins
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. hausman, save
.
. reg $depv $ereg $control
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Source	SS	df	MS	Number of obs =	4635
Model	27.2014009	21	1.2953048	F(21, 4613) =	49.68
Residual	120.273786	4613	.026072791	Prob > F =	0.0000
-----				R-squared =	0.1844
-----				Adj R-squared =	0.1807
Total	147.475187	4634	.031824598	Root MSE =	.16147

knowscor	Coef.	Std. Err.	t	P> t	[99% Conf. Interval]	
usoc	.0272816	.0066331	4.11	0.000	.0101888	.0443743
age	-.0006023	.0002342	-2.57	0.010	-.0012057	1.22e-06
r_black	-.0684274	.0072743	-9.41	0.000	-.0871724	-.0496824
r_asian	-.08543	.0151192	-5.65	0.000	-.1243907	-.0464693
r_other	-.0266554	.0140914	-1.89	0.059	-.0629674	.0096566
latino	-.0464294	.0083684	-5.55	0.000	-.0679938	-.0248651
ed_hs	.0534471	.0072396	7.38	0.000	.0347914	.0721028
ed_coll	.1053405	.0080909	13.02	0.000	.0844912	.1261898
ed_bach	.140125	.0096258	14.56	0.000	.1153203	.1649297
ed_grad	.1653602	.0107559	15.37	0.000	.1376435	.193077
mar_mar	.0133524	.0076823	1.74	0.082	-.0064442	.033149
mar_div	-.0051196	.0086121	-0.59	0.552	-.027312	.0170728
mar_wid	.0050399	.0139525	0.36	0.718	-.0309143	.0409941
hchild	.0140009	.0063207	2.22	0.027	-.0022867	.0302886
famsize	-.0093884	.002241	-4.19	0.000	-.0151631	-.0036137
finc_35	.0056388	.0071602	0.79	0.431	-.0128123	.0240899
finc_25	-.0027604	.0073718	-0.37	0.708	-.0217569	.016236
finc_20	-.0223892	.0091584	-2.44	0.015	-.0459896	.0012111
finc_10	-.0253755	.0095236	-2.66	0.008	-.0499169	-.0008342
finc_5	-.039396	.0096486	-4.08	0.000	-.0642593	-.0145326
finc_0	-.0513955	.0108253	-4.75	0.000	-.0792911	-.0235
_cons	.5535182	.0153443	36.07	0.000	.5139776	.5930588

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. hausman, constant sigmamore
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	---- Coefficients ----			
	(b) Prior	(B) Current	(b-B) Difference	sqrt(diag(V_b-V_B)) S.E.
usoc	.1313097	.0272816	.1040281	.0504617
age	-.0009117	-.0006023	-.0003094	.0001501
r_black	-.0730895	-.0684274	-.0046621	.0022615
r_asian	-.079506	-.08543	.005924	.0028736
r_other	-.0322982	-.0266554	-.0056428	.0027372
latino	-.0406962	-.0464294	.0057333	.0027811

ed_hs	.053279	.0534471	-.0001681	.0000815
ed_coll	.1025753	.1053405	-.0027652	.0013413
ed_bach	.1413349	.140125	.0012099	.0005869
ed_grad	.1623123	.1653602	-.003048	.0014785
mar_mar	.0133401	.0133524	-.0000123	5.96e-06
mar_div	-.0042458	-.0051196	.0008738	.0004238
mar_wid	.0076735	.0050399	.0026336	.0012775
hchild	.0104211	.0140009	-.0035799	.0017365
famsize	-.0090906	-.0093884	.0002978	.0001445
finc_35	.0061095	.0056388	.0004707	.0002283
finc_25	-.0023333	-.0027604	.0004272	.0002072
finc_20	-.0206913	-.0223892	.001698	.0008236
finc_10	-.0167826	-.0253755	.0085929	.0041682
finc_5	-.0364215	-.039396	.0029744	.0014428
finc_0	-.0476887	-.0513955	.0037069	.0017981
_cons	.477528	.5535182	-.0759902	.0368611

b = less efficient estimates obtained previously from ivreg
B = fully efficient estimates obtained from regress

Test: Ho: difference in coefficients not systematic

chi2(1) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 4.25
Prob>chi2 = 0.0393

* Test endogeneity using augmented regression

reg \$reg \$iv \$control

Source	SS	df	MS	Number of obs =	4635
Model	23.5572577	23	1.0242286	F(23, 4611) =	8.11
Residual	582.528179	4611	.126334457	Prob > F =	0.0000
				R-squared =	0.0389
				Adj R-squared =	0.0341
Total	606.085437	4634	.130790988	Root MSE =	.35544

usoc	Coef.	Std. Err.	t	P> t	[99% Conf. Interval]	
state	.0036955	.0006672	5.54	0.000	.0019761	.0054149
hlt_fp	.0497971	.0176855	2.82	0.005	.0042234	.0953709
ins	.1026407	.0153573	6.68	0.000	.0630665	.142215
age	.0020059	.0005297	3.79	0.000	.0006409	.0033708
r_black	.0376138	.016101	2.34	0.020	-.0038768	.0791044
r_asian	-.0715843	.0333772	-2.14	0.032	-.1575938	.0144252
r_other	.0520691	.0310251	1.68	0.093	-.0278795	.1320176
latino	-.0553893	.0185143	-2.99	0.003	-.1030989	-.0076798
ed_hs	-.0025879	.016164	-0.16	0.873	-.0442407	.039065
ed_coll	.0169142	.0181872	0.93	0.352	-.0299524	.0637808
ed_bach	-.0195032	.0216115	-0.90	0.367	-.0751938	.0361874
ed_grad	.02355	.024033	0.98	0.327	-.0383806	.0854806
mar_mar	.0027591	.0169778	0.16	0.871	-.0409909	.0465092
mar_div	-.000238	.0189826	-0.01	0.990	-.0491541	.0486781
mar_wid	-.0242723	.0307285	-0.79	0.430	-.1034565	.0549118
hchild	.0321131	.0139091	2.31	0.021	-.0037293	.0679555
famsize	-.0000559	.0049812	-0.01	0.991	-.0128919	.01278
finc_35	-.0103017	.0157813	-0.65	0.514	-.0509684	.0303649
finc_25	-.008898	.0162373	-0.55	0.584	-.0507398	.0329439
finc_20	-.0089174	.0201871	-0.44	0.659	-.0609374	.0431025
finc_10	-.0507721	.0216251	-2.35	0.019	-.1064977	.0049535
finc_5	.0188734	.0228868	0.82	0.410	-.0401036	.0778504
finc_0	.0088844	.0250951	0.35	0.723	-.0557831	.0735519

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      _cons |      .5744777      .0370451      15.51      0.000      .4790164      .669939

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. predict ereghat, xb

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. reg $depv $ereg $control ereghat

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Source	SS	df	MS	Number of obs =	4635
Model	27.3122073	22	1.24146397	F(22, 4612) =	47.65
Residual	120.16298	4612	.026054419	Prob > F =	0.0000
				R-squared =	0.1852
				Adj R-squared =	0.1813
Total	147.475187	4634	.031824598	Root MSE =	.16141

knowscor	Coef.	Std. Err.	t	P> t	[99% Conf. Interval]
usoc	.0254841	.0066878	3.81	0.000	.0082504 .0427178
age	-.0009117	.0002781	-3.28	0.001	-.0016282 -.0001951
r_black	-.0730895	.007615	-9.60	0.000	-.0927126 -.0534665
r_asian	-.079506	.0153845	-5.17	0.000	-.1191502 -.0398618
r_other	-.0322982	.0143497	-2.25	0.024	-.0692759 .0046795
latino	-.0406962	.0088153	-4.62	0.000	-.0634122 -.0179801
ed_hs	.053279	.0072375	7.36	0.000	.0346287 .0719294
ed_coll	.1025753	.0081984	12.51	0.000	.0814489 .1237017
ed_bach	.1413349	.0096403	14.66	0.000	.1164929 .1661769
ed_grad	.1623123	.0108532	14.96	0.000	.1343448 .1902798
mar_mar	.0133401	.0076796	1.74	0.082	-.0064495 .0331297
mar_div	-.0042458	.0086195	-0.49	0.622	-.0264572 .0179656
mar_wid	.0076735	.0140059	0.55	0.584	-.0284183 .0437654
hchild	.0104211	.0065525	1.59	0.112	-.0064642 .0273063
famsize	-.0090906	.0022448	-4.05	0.000	-.0148753 -.0033059
finc_35	.0061095	.0071613	0.85	0.394	-.0123445 .0245634
finc_25	-.0023333	.0073722	-0.32	0.752	-.0213305 .016664
finc_20	-.0206913	.0091922	-2.25	0.024	-.0443785 .0029959
finc_10	-.0167826	.0103922	-1.61	0.106	-.0435622 .009997
finc_5	-.0364215	.0097524	-3.73	0.000	-.0615525 -.0112906
finc_0	-.0476887	.0109697	-4.35	0.000	-.0759565 -.0194209
ereghat	.1058256	.0513155	2.06	0.039	-.0264092 .2380604
_cons	.477528	.0399132	11.96	0.000	.3746757 .5803802

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. testparm ereghat

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( 1) ereghat = 0.0

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      F( 1, 4612) =      4.25
      Prob > F =      0.0392

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. * Test non-zero average causal effect

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. reg $ereg $iv $control

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Source	SS	df	MS	Number of obs =	4635
Model	23.5572577	23	1.0242286	F(23, 4611) =	8.11
Residual	582.528179	4611	.126334457	Prob > F =	0.0000
				R-squared =	0.0389
				Adj R-squared =	0.0341
Total	606.085437	4634	.130790988	Root MSE =	.35544

usoc	Coef.	Std. Err.	t	P> t	[99% Conf. Interval]
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state	.0036955	.0006672	5.54	0.000	.0019761	.0054149
hlt_fp	.0497971	.0176855	2.82	0.005	.0042234	.0953709
ins	.1026407	.0153573	6.68	0.000	.0630665	.142215
age	.0020059	.0005297	3.79	0.000	.0006409	.0033708
r_black	.0376138	.016101	2.34	0.020	-.0038768	.0791044
r_asian	-.0715843	.0333772	-2.14	0.032	-.1575938	.0144252
r_other	.0520691	.0310251	1.68	0.093	-.0278795	.1320176
latino	-.0553893	.0185143	-2.99	0.003	-.1030989	-.0076798
ed_hs	-.0025879	.016164	-0.16	0.873	-.0442407	.039065
ed_coll	.0169142	.0181872	0.93	0.352	-.0299524	.0637808
ed_bach	-.0195032	.0216115	-0.90	0.367	-.0751938	.0361874
ed_grad	.02355	.024033	0.98	0.327	-.0383806	.0854806
mar_mar	.0027591	.0169778	0.16	0.871	-.0409909	.0465092
mar_div	-.000238	.0189826	-0.01	0.990	-.0491541	.0486781
mar_wid	-.0242723	.0307285	-0.79	0.430	-.1034565	.0549118
hchild	.0321131	.0139091	2.31	0.021	-.0037293	.0679555
famsize	-.0000559	.0049812	-0.01	0.991	-.0128919	.01278
finc_35	-.0103017	.0157813	-0.65	0.514	-.0509684	.0303649
finc_25	-.008898	.0162373	-0.55	0.584	-.0507398	.0329439
finc_20	-.0089174	.0201871	-0.44	0.659	-.0609374	.0431025
finc_10	-.0507721	.0216251	-2.35	0.019	-.1064977	.0049535
finc_5	.0188734	.0228868	0.82	0.410	-.0401036	.0778504
finc_0	.0088844	.0250951	0.35	0.723	-.0557831	.0735519
_cons	.5744777	.0370451	15.51	0.000	.4790164	.669939

. testparm \$iv

- (1) state = 0.0
- (2) hlt_fp = 0.0
- (3) ins = 0.0

F(3, 4611) = 26.56
 Prob > F = 0.0000

. * Test sensitivity to exclusion restrictions

. ivreg \$depv ins \$control (\$reg = state hlt_fp)

Instrumental variables (2SLS) regression

Source	SS	df	MS	Number of obs =	4635
Model	2.00256755	22	.091025798	F(22, 4612) =	40.21
Residual	145.47262	4612	.031542199	Prob > F =	0.0000
Total	147.475187	4634	.031824598	R-squared =	0.0136
				Adj R-squared =	0.0089
				Root MSE =	.1776

knowscor	Coef.	Std. Err.	t	P> t	[99% Conf. Interval]
usoc	-.186912	.0801788	-2.33	0.020	-.3935244 .0197005
ins	.0606591	.0109417	5.54	0.000	.0324635 .0888547
age	-.0000968	.0003394	-0.29	0.776	-.0009714 .0007779
r_black	-.0582341	.0087967	-6.62	0.000	-.0809024 -.0355658
r_asian	-.0974651	.0172345	-5.66	0.000	-.1418766 -.0530535
r_other	-.013263	.0161578	-0.82	0.412	-.0549 .0283739
latino	-.0529791	.0099492	-5.32	0.000	-.078617 -.0273411
ed_hs	.0463336	.0080613	5.75	0.000	.0255605 .0671067
ed_coll	.0989053	.0090448	10.94	0.000	.0755977 .1222129
ed_bach	.124046	.011056	11.22	0.000	.0955558 .1525361
ed_grad	.1592069	.0119547	13.32	0.000	.1284008 .190013

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mar_mar | .0112021 .0084586 1.32 0.185 -.0105948 .032999
mar_div | -.0046411 .0094841 -0.49 0.625 -.0290807 .0197985
mar_wid | -.002013 .0155093 -0.13 0.897 -.0419788 .0379528
hchild | .0207239 .0074453 2.78 0.005 .0015381 .0399098
famsize | -.0074276 .0024881 -2.99 0.003 -.0138392 -.0010161
finc_35 | .0017219 .0079191 0.22 0.828 -.0186849 .0221287
finc_25 | -.0050338 .0081261 -0.62 0.536 -.0259739 .0159063
finc_20 | -.021656 .0101155 -2.14 0.032 -.0477226 .0044105
finc_10 | -.0218742 .0114712 -1.91 0.057 -.0514342 .0076859
finc_5 | -.0129914 .0115327 -1.13 0.260 -.04271 .0167272
finc_0 | -.0290994 .0125269 -2.32 0.020 -.06138 .0031812
_cons | .6643498 .0553555 12.00 0.000 .5217045 .8069951

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Instrumented: usoc

Instruments: ins age r_black r_asian r_other latino ed_hs ed_coll ed_bach
ed_grad mar_mar mar_div mar_wid hchild famsize finc_35 finc_25
finc_20 finc_10 finc_5 finc_0 state hlt_fp

. testparm ins

(1) ins = 0.0

F(1, 4612) = 30.73
Prob > F = 0.0000

. ivreg \$depv hlt_fp \$control (\$ereg = state ins)

Instrumental variables (2SLS) regression

Source	SS	df	MS	Number of obs =	4635
Model	16.568122	22	.753096452	F(22, 4612) =	43.36
Residual	130.907065	4612	.028384012	Prob > F =	0.0000
				R-squared =	0.1123
				Adj R-squared =	0.1081
Total	147.475187	4634	.031824598	Root MSE =	.16848

knowscor	Coef.	Std. Err.	t	P> t	[99% Conf. Interval]
usoc	.1621879	.0548669	2.96	0.003	.0208018 .3035741
hlt_fp	-.0192976	.0086227	-2.24	0.025	-.0415175 .0029223
age	-.0009175	.0002902	-3.16	0.002	-.0016654 -.0001696
r_black	-.0726006	.0079512	-9.13	0.000	-.0930899 -.0521113
r_asian	-.0776866	.0160781	-4.83	0.000	-.1191182 -.036255
r_other	-.0331017	.0149818	-2.21	0.027	-.0717082 .0055048
latino	-.0387563	.0092417	-4.19	0.000	-.0625711 -.0149415
ed_hs	.0509676	.0076244	6.68	0.000	.0313202 .070615
ed_coll	.0993178	.00868	11.44	0.000	.0769503 .1216852
ed_bach	.139094	.0101117	13.76	0.000	.1130371 .1651508
ed_grad	.1585182	.0114542	13.84	0.000	.129002 .1880343
mar_mar	.0137577	.0080178	1.72	0.086	-.0069033 .0344187
mar_div	-.0039421	.0089976	-0.44	0.661	-.0271279 .0192437
mar_wid	.0088592	.0146283	0.61	0.545	-.0288364 .0465548
hchild	.0091866	.0068614	1.34	0.181	-.0084946 .0268677
famsize	-.0089397	.002344	-3.81	0.000	-.0149799 -.0028994
finc_35	.0060309	.0074747	0.81	0.420	-.0132307 .0252924
finc_25	-.0018404	.0076978	-0.24	0.811	-.0216769 .0179962
finc_20	-.0202109	.0095967	-2.11	0.035	-.0449406 .0045188
finc_10	-.0125533	.0110102	-1.14	0.254	-.0409255 .0158188
finc_5	-.0321201	.0103589	-3.10	0.002	-.058814 -.0054262
finc_0	-.0433562	.0116121	-3.73	0.000	-.0732795 -.0134329
_cons	.4544572	.0429159	10.59	0.000	.3438673 .565047

```
-----
Instrumented:  usoc
Instruments:  hlt_fp age r_black r_asian r_other latino ed_hs ed_coll ed_bach
              ed_grad mar_mar mar_div mar_wid hchild famsize finc_35 finc_25
              finc_20 finc_10 finc_5 finc_0 state ins
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```
. testparm hlt_fp
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```
( 1)  hlt_fp = 0.0
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```
      F( 1, 4612) =    5.01
      Prob > F   =    0.0253
```

```
. ivreg $depv state $control ($sreg = ins hlt_fp)
```

```
Instrumental variables (2SLS) regression
```

Source	SS	df	MS	Number of obs =	4635
Model	-27.1864697	22	-1.23574862	F(22, 4612) =	33.14
Residual	174.661657	4612	.037871131	Prob > F =	0.0000
				R-squared =	.
				Adj R-squared =	.
Total	147.475187	4634	.031824598	Root MSE =	.19461

knowscor	Coef.	Std. Err.	t	P> t	[99% Conf. Interval]
usoc	.3332364	.0778176	4.28	0.000	.1327086 .5337642
state	-.0019542	.0004634	-4.22	0.000	-.0031484 -.00076
age	-.0012352	.0003439	-3.59	0.000	-.0021214 -.000349
r_black	-.0803546	.0093411	-8.60	0.000	-.1044257 -.0562835
r_asian	-.0602044	.0191044	-3.15	0.002	-.1094344 -.0109743
r_other	-.0417036	.0174436	-2.39	0.017	-.0866539 .0032467
latino	-.0250438	.0112575	-2.22	0.026	-.0540532 .0039655
ed_hs	.051587	.008735	5.91	0.000	.0290778 .0740961
ed_coll	.0947924	.0100551	9.43	0.000	.0688815 .1207032
ed_bach	.1392363	.0116332	11.97	0.000	.1092586 .1692139
ed_grad	.1522577	.0133004	11.45	0.000	.117984 .1865314
mar_mar	.0093983	.0093059	1.01	0.313	-.014582 .0333785
mar_div	-.0048881	.010393	-0.47	0.638	-.0316697 .0218935
mar_wid	.0102236	.0168968	0.61	0.545	-.0333177 .0537648
hchild	.004343	.0080304	0.54	0.589	-.0163503 .0250364
famsize	-.007779	.0027242	-2.86	0.004	-.0147991 -.0007589
finc_35	.0077383	.0086425	0.90	0.371	-.0145326 .0300093
finc_25	-.000717	.0088963	-0.08	0.936	-.023642 .0222079
finc_20	-.0174945	.0111082	-1.57	0.115	-.0461192 .0111302
finc_10	-.0002613	.0131274	-0.02	0.984	-.0340892 .0335667
finc_5	-.0313066	.0118202	-2.65	0.008	-.0617659 -.0008472
finc_0	-.0416654	.0133023	-3.13	0.002	-.0759441 -.0073868
_cons	.3723899	.0541962	6.87	0.000	.2327321 .5120477

```
-----
Instrumented:  usoc
Instruments:  state age r_black r_asian r_other latino ed_hs ed_coll ed_bach
              ed_grad mar_mar mar_div mar_wid hchild famsize finc_35 finc_25
              finc_20 finc_10 finc_5 finc_0 ins hlt_fp
-----
```

```
. testparm state
```

```
( 1)  state = 0.0
```

```
      F( 1, 4612) =   17.78
```

Prob > F = 0.0000

. * Formal test of the overidentifying restrictions

. * Large values for the test statistic imply failure of the assumption that the instruments are only indirectly correlated (through the endogenous regressor) with the outcome

. ivreg \$depv \$control (\$reg = \$iv)

Instrumental variables (2SLS) regression

Source	SS	df	MS	Number of obs =	4635
Model	20.7884412	21	.989925772	F(21, 4613) =	46.70
Residual	126.686746	4613	.027462984	Prob > F =	0.0000
				R-squared =	0.1410
				Adj R-squared =	0.1371
Total	147.475187	4634	.031824598	Root MSE =	.16572

knowscor	Coef.	Std. Err.	t	P> t	[99% Conf. Interval]	
usoc	.1313097	.0522351	2.51	0.012	-.0032946	.265914
age	-.0009117	.0002855	-3.19	0.001	-.0016473	-.000176
r_black	-.0730895	.0078181	-9.35	0.000	-.0932361	-.052943
r_asian	-.079506	.0157949	-5.03	0.000	-.1202077	-.0388043
r_other	-.0322982	.0147325	-2.19	0.028	-.0702623	.0056659
latino	-.0406962	.0090504	-4.50	0.000	-.0640182	-.0173742
ed_hs	.053279	.0074306	7.17	0.000	.0341312	.0724269
ed_coll	.1025753	.0084171	12.19	0.000	.0808853	.1242653
ed_bach	.1413349	.0098974	14.28	0.000	.1158302	.1668395
ed_grad	.1623123	.0111427	14.57	0.000	.1335987	.1910258
mar_mar	.0133401	.0078845	1.69	0.091	-.0069774	.0336576
mar_div	-.0042458	.0088494	-0.48	0.631	-.0270497	.0185581
mar_wid	.0076735	.0143796	0.53	0.594	-.0293811	.0447282
hchild	.0104211	.0067273	1.55	0.121	-.0069146	.0277567
famsize	-.0090906	.0023047	-3.94	0.000	-.0150296	-.0031516
finc_35	.0061095	.0073524	0.83	0.406	-.0128368	.0250557
finc_25	-.0023333	.0075688	-0.31	0.758	-.0218373	.0171708
finc_20	-.0206913	.0094374	-2.19	0.028	-.0450104	.0036278
finc_10	-.0167826	.0106694	-1.57	0.116	-.0442765	.0107113
finc_5	-.0364215	.0100125	-3.64	0.000	-.0622228	-.0106203
finc_0	-.0476887	.0112623	-4.23	0.000	-.0767106	-.0186668
_cons	.477528	.0409779	11.65	0.000	.3719321	.5831239

Instrumented: usoc

Instruments: age r_black r_asian r_other latino ed_hs ed_coll ed_bach ed_grad mar_mar mar_div mar_wid hchild famsize finc_35 finc_25 finc_20 finc_10 finc_5 finc_0 state hlt_fp ins

. predict res, residuals

. reg res \$iv \$control

Source	SS	df	MS	Number of obs =	4635
Model	.970005366	23	.042174146	F(23, 4611) =	1.55
Residual	125.716741	4611	.027264528	Prob > F =	0.0461
				R-squared =	0.0077
				Adj R-squared =	0.0027
Total	126.686746	4634	.02733853	Root MSE =	.16512

res	Coef.	Std. Err.	t	P> t	[99% Conf. Interval]	
state	-.0011967	.00031	-3.86	0.000	-.0019955	-.000398
hlt_fp	-.0147774	.0082159	-1.80	0.072	-.035949	.0063941
ins	.0280787	.0071343	3.94	0.000	.0096943	.0464632
age	.0001746	.0002461	0.71	0.478	-.0004595	.0008087
r_black	.0028019	.0074798	0.37	0.708	-.0164728	.0220766
r_asian	.0049003	.0155056	0.32	0.752	-.035056	.0448565
r_other	.0024362	.0144129	0.17	0.866	-.0347044	.0395768
latino	.0053851	.0086009	0.63	0.531	-.0167787	.0275488
ed_hs	-.0060212	.0075091	-0.80	0.423	-.0253713	.0133289
ed_coll	-.0089595	.008449	-1.06	0.289	-.0307316	.0128127
ed_bach	-.0110041	.0100398	-1.10	0.273	-.0368755	.0148673
ed_grad	-.0105001	.0111647	-0.94	0.347	-.0392704	.0182701
mar_mar	-.0030838	.0078871	-0.39	0.696	-.0234082	.0172405
mar_div	-.0003437	.0088185	-0.04	0.969	-.023068	.0223805
mar_wid	-.0020143	.0142751	-0.14	0.888	-.0387998	.0347712
hchild	.0001017	.0064616	0.02	0.987	-.0165491	.0167524
famsize	.0016885	.002314	0.73	0.466	-.0042745	.0076516
finc_35	-.0010936	.0073313	-0.15	0.881	-.0199856	.0177983
finc_25	.0001172	.0075431	0.02	0.988	-.0193207	.019555
finc_20	.001879	.009378	0.20	0.841	-.0222872	.0260452
finc_10	.0109992	.0100461	1.09	0.274	-.0148884	.0368869
finc_5	.0172719	.0106322	1.62	0.104	-.0101262	.04467
finc_0	.0156111	.0116581	1.34	0.181	-.0144306	.0456528
_cons	.0044266	.0172095	0.26	0.797	-.0399205	.0487738

```
. fitstat, saving(stat)
```

Measures of Fit for regress of res

Log-Lik Intercept Only:	1765.464	Log-Lik Full Model:	1783.277
D(4611):	-3566.554	LR(23):	35.625
		Prob > LR:	0.045
R2:	0.008	Adjusted R2:	0.003
AIC:	-0.759	AIC*n:	-3518.554
BIC:	-42489.810	BIC':	158.527

(Indices saved in matrix fs_stat)

```
. gen tr2 = e(N)*e(r2)
```

```
. di "Chi-squared value is " tr2 " with " $overid " degrees of freedom"
Chi-squared value is 35.488914 with 2 degrees of freedom
```

```
. di "p-value = " chi2tail($overid, tr2)
p-value = 1.966e-08
```

```
. drop _all
```

```
. log close
```