Problem Set #2-Key

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Economics 421- Seminar in Labor Economics

Introduction to the Labor-Leisure Model II: Labor Supply & Endogeneity

Estimating supply functions inherently involves endogeneity and identification problems. In place of a labor demand function, use the following "wage offer" function to identify the labor supply function:

$$Wage = \alpha_0 + \alpha_1 hours_i + \alpha_2 Schooling_i + \alpha_3 Experience_i + \alpha_4 Experience_i^2 + v$$

(1) Test the labor supply functions for endogeneity using the Hausman test.
There are four steps to the Hausman test:

Step 1: Take the right hand side variable you want to test and use it as the dependent variable with all the exogenous variables available (from every equation in the model) serving as independent variables. This is the same as running the reduced form regression.

The Supply and Demand functions for the labor market
Labor Supply Function: $h_i = \beta_0 + \beta_1 \log(wage)_i + \beta_2 \log(\text{non-labor income})_i + \beta_3 Z_i$
Wage Offer Function: $Wage = \alpha_0 + \alpha_1 hours_i + \alpha_2 Schooling_i + \alpha_3 Experience_i + \alpha_4 Experience_i^2 + v$

Reduced form equation:
$Wage = \Upsilon_0 + \Upsilon_1 hours_i + \Upsilon_2 Schooling_i + \Upsilon_3 Experience_i + \Upsilon_4 Experience_i^2 + \Upsilon_2 \log(\text{non-labor income})_i + \Upsilon_3 Z_i + \xi_i$

VARIABLES	lnwage
lnNLI	-0.00762***
	[0.00154]
school	0.121***
	[0.00112]
_child6	0.0708***
	[0.00490]
child6to18	0.0197***
	[0.00314]
exper	0.0264***
	[0.00153]
exper2	-0.000357***
	[3.69e-05]
Constant	0.937***
	[0.0263]
Observations	53,894
R-squared	0.187

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Step 2: Save the error term observation (i.e., residuals) from step 1.

Step 3: Add the error term observations as an independent variable to the original structural form equation (i.e., the labor supply function) that the variable being tested comes from. Use OLS to estimate the regression.

VARIABLES	ernush
lnwage	9.723***
	[1.508]
lnNLI	-0.480***
	[0.0255]
school	-0.614***
	[0.167]
age	-0.0403**
	[0.0188]
_child6	-0.662***
	[0.133]
child6to18	-0.479***
	[0.0626]
error	-9.568***
	[1.509]
Constant	26.62***
	[1.496]
Observations	53,894
R-squared	0.031

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Step 4: Use the t-statistic to see if the slope coefficient of the error term in step 3 is statistically significant. If so, there is evidence of simultaneity.

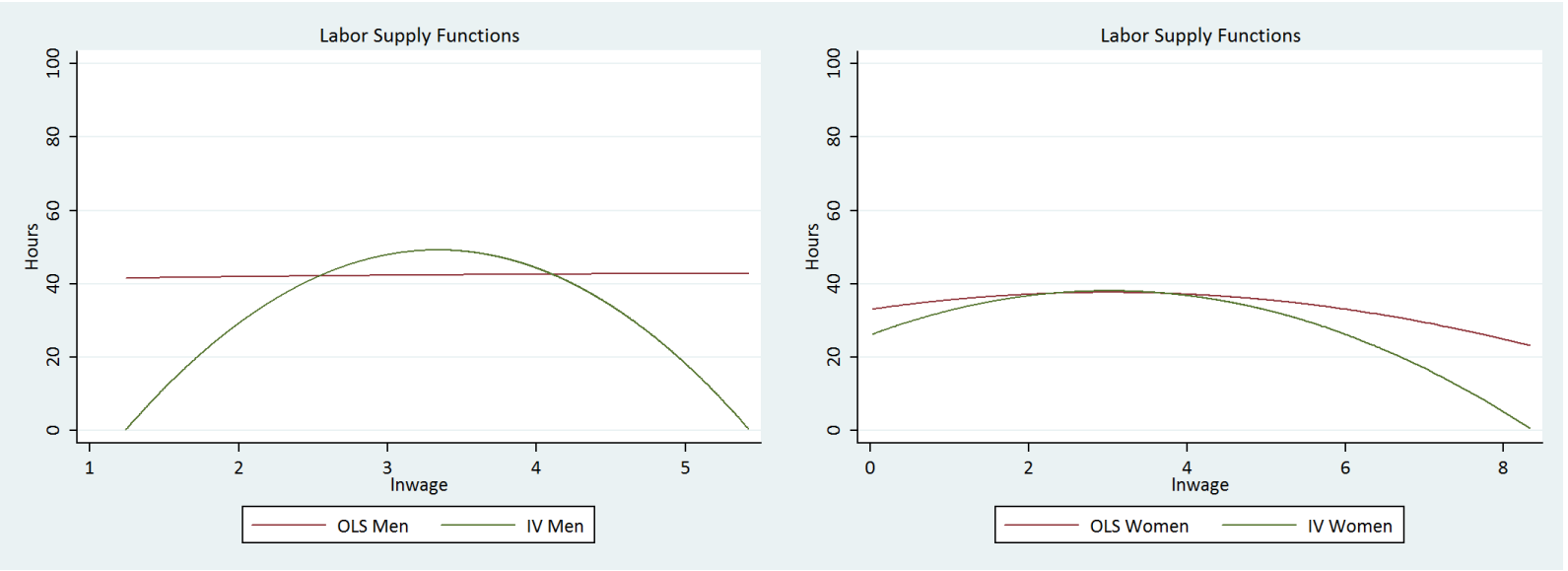
Table 1-OLS versus IV Regressions for Men

	(2i)	(2i)	(3i)	(3i)	(3ii)	(3ii)	(3iii)	(3iii)	(3iv)	(3iv)	(5i)	(5i)
	OLS All	IV All	OLS Men	IV Men	OLS Under$25	IV Under $25	OLS Over $25	IV Over $25	OLS Quadratic	IV Quadratic	OLS	IV
VARIABLES	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	lnHours	lnHours
lnwage	0.244***	9.235***	-0.932***	7.221***	-0.0511	17.88**	-2.155***	21.82**	0.242	58.58**	0.0383***	1.957**
	[0.0631]	[1.722]	[0.0831]	[1.939]	[0.136]	[8.791]	[0.189]	[8.781]	[0.182]	[25.91]	[0.00502]	[0.826]
lnwage2									-0.218***	-8.808**	-0.0128***	-0.295**
									[0.0302]	[3.816]	[0.000830]	[0.122]
lnNLI	-0.539***	-0.469***	-0.256***	-0.220***	-0.241***	-0.122	-0.268***	-0.263***	-0.253***	-0.0823	-0.00645***	-0.000828
	[0.0225]	[0.0298]	[0.0281]	[0.0340]	[0.0386]	[0.0811]	[0.0412]	[0.0656]	[0.0281]	[0.0981]	[0.000773]	[0.00313]
school	0.436***	-0.557***	0.631***	-0.257	0.572***	-0.165	0.771***	-0.392	0.653***	0.221	0.0170***	0.00279
	[0.0170]	[0.191]	[0.0217]	[0.212]	[0.0289]	[0.364]	[0.0343]	[0.429]	[0.0219]	[0.198]	[0.000603]	[0.00632]
age	0.0738***	-0.0331	0.109***	-0.00187	0.113***	0.0341	0.106***	-0.0360	0.112***	0.0749***	0.00310***	0.00186***
	[0.00516]	[0.0213]	[0.00675]	[0.0275]	[0.00854]	[0.0407]	[0.0113]	[0.0550]	[0.00675]	[0.0224]	[0.000186]	[0.000714]
_child6	0.0924	-0.574***	0.818***	0.256	0.909***	0.345	0.666***	0.111	0.831***	0.489**	0.0222***	0.0110
	[0.0719]	[0.153]	[0.0879]	[0.168]	[0.120]	[0.327]	[0.132]	[0.292]	[0.0878]	[0.247]	[0.00242]	[0.00786]
child6to18	-0.179***	-0.445***	0.693***	0.136	0.680***	0.123	0.718***	-0.0890	0.705***	0.353*	0.0196***	0.00801
	[0.0432]	[0.0720]	[0.0564]	[0.148]	[0.0776]	[0.295]	[0.0831]	[0.324]	[0.0564]	[0.200]	[0.00155]	[0.00638]
Constant	35.50***	26.86***	33.78***	25.70***	32.00***	-3.214	36.39***	-28.57	31.87***	-55.40	3.410***	0.540
	[0.376]	[1.711]	[0.474]	[1.997]	[0.696]	[17.28]	[0.939]	[23.83]	[0.542]	[38.78]	[0.0149]	[1.236]
Observations	52,515	52,515	26,217	26,217	15,402	15,402	10,534	10,534	26,217	26,217	26,217	26,217
R-squared	0.031		0.052		0.046		0.067		0.054		0.053	

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

	(2i)	(2i)	(4i)	(4i)	(4ii)	(4ii)	(4iii)	(4iii)	(4iv)	(4iv)	(5i)	(5i)
	OLS All	IV All	OLS Women	IV Women	OLS Under$25	IV Under$25	OLS Over $25	IV Over $25	OLS Quadratic	IV Quadratic	OLS	IV
VARIABLES	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	Hours	lnHours	lnHours
lnwage	0.244***	9.235***	-0.334***	10.27***	1.537***	30.20***	-5.392***	189.6	2.579***	254.7	0.151***	10.83
	[0.0631]	[1.722]	[0.0923]	[2.950]	[0.127]	[1.368]	[0.291]	[297.3]	[0.233]	[371.2]	[0.00901]	[15.69]
lnwage2									-0.565***	-41.85	-0.0351***	-1.784
									[0.0415]	[60.80]	[0.00161]	[2.570]
lnNLI	-0.539***	-0.469***	-0.438***	-0.549***	-0.442***	-0.601***	-0.357***	-2.396	-0.426***	-0.00931	-0.0164***	0.00128
	[0.0225]	[0.0298]	[0.0342]	[0.0521]	[0.0395]	[0.0667]	[0.0666]	[3.158]	[0.0341]	[0.656]	[0.00132]	[0.0277]
school	0.436***	-0.557***	0.478***	-0.738**	0.269***	-1.210***	1.134***	-3.730	0.520***	-0.900	0.0170***	-0.0432
	[0.0170]	[0.191]	[0.0250]	[0.339]	[0.0282]	[0.0979]	[0.0541]	[7.431]	[0.0251]	[2.099]	[0.000972]	[0.0887]
age	0.0738***	-0.0331	0.0207***	-0.0700***	-0.00760	-0.111***	0.116***	-0.415	0.0248***	-0.0168	0.000745***	-0.00101
	[0.00516]	[0.0213]	[0.00734]	[0.0268]	[0.00809]	[0.0132]	[0.0164]	[0.821]	[0.00732]	[0.0787]	[0.000283]	[0.00333]
_child6	0.0924	-0.574***	-1.357***	-1.798***	-1.189***	-0.645***	-1.611***	-8.861	-1.315***	0.112	-0.0514***	0.00907
	[0.0719]	[0.153]	[0.110]	[0.182]	[0.126]	[0.224]	[0.223]	[11.21]	[0.110]	[2.229]	[0.00425]	[0.0942]
child6to18	-0.179***	-0.445***	-0.993***	-0.879***	-1.002***	-0.569***	-0.901***	-4.457	-0.972***	0.977	-0.0353***	0.0473
	[0.0432]	[0.0720]	[0.0616]	[0.0817]	[0.0684]	[0.122]	[0.134]	[5.534]	[0.0614]	[2.900]	[0.00238]	[0.123]
Constant	35.50***	26.86***	36.23***	28.25***	35.59***	-11.70***	39.08***	-549.4	31.89***	-314.6	3.377***	-11.30
	[0.376]	[1.711]	[0.550]	[2.316]	[0.668]	[2.127]	[1.544]	[897.3]	[0.634]	[510.2]	[0.0246]	[21.57]
Observations	52,515	52,515	26,298	26,298	19,395	27,153	6,639	6,639	26,298	26,298	26,298	26,298
R-squared	0.031		0.037		0.039		0.120		0.044		0.048	


Labor Supply Functions
Hours
0
20
40
60
80
100
1
2
3
4
5
lnwage
OLS Men
IV Men
Labor Supply Functions
Hours
0
20
40
60
80
100
0
2
4
6
8
lnwage
OLS Women
IV Women