Bernardo Arreal Magalhaes
UTEID ba25727

Causal Inference
MA Economics
The University of Texas at Austin
Spring 2020

**Replication - Children and Their Parents' Labor Supply:**
**Evidence from Exogenous Variation in Family Size, by Joshua D. Angrist; William N. Evans**

I. Brief summary

In this paper, Angrist and Evans address a question regarding the causal link running from fertility to the work effort of both men and women. They mention several studies in the reaserch agenda that corroborate the theoretical reasons from Schultz (1981) and Golidin (1990), suggesting that fertility and labor supply are jointly determined, what creates a endogeneity problem and brings difficulties when trying to disentangle the causal mechanism from the correlation between fertility and labor supply. The authors analyzed information on labor supply from the 1980 and 1990 Census Public Use Micro Samples (PUMS).

The empirical analysis is conducted on two subsamples from each Census. The first includes all women with two or more children, and the second includes only married women. Given (i) the phenomenon of parental preferences for a mixed sibling-sex composition, which has been documented in multiple empirical studies and theoretically explored by Becker and Lewis (1973), Becker and Tomes ( 1976) and Wosenzweig and Wolpin (1980), and (ii) the fact that it is virtually random whether an individual's first two children are of the same sex or not, the authors argue that having the first two children of the same sex is a factor that exogeneously affect fertiliy, what qualifies it to be used as a valid instrumental variable.

Angrist and Evans find statistically significant evidence of fertility reducing labor supply. They show that when using instrumental variables, the estimates for the causal effect are substantial but smaller than the corresponding OLS estimates. They also find evidence suggesting that this effect might be absent among college educated women and women with high-wage husbands, which contradicts some theories of household time allocation. Finally, the results show that husbands don't considerably change their labor-market behavior in response to a change in family size.

II. Replication

**TABLE 1-FERTILITY AND LABOR-SUPPLY MEASURES**

| Sample | 1980 PUMS |
|---|---|
| Women aged 21-35 | |
| Mean children ever born | 2.51 |
| Percent with more than 2 children | 38.06 |
| Percent worked last year | 52.82 |
| Observations | 254,654 |

**TABLE 2-DESCRIPTIVE STATISTICS, WOMEN AGED 21-35 WITH 2 OR MORE CHILDREN**

| | Means and (standard deviations) |
|---|---|
| | 1980 PUMS |
| Variable | All women |
| Children ever born | 2.508 (0.769) |
| More than 2 children (=1 if mother had more than 2 children, =0 otherwise) | 0.381 (0.486) |
| Boy 1st (=1 if first child was a boy) | 0.514 (0.500) |
| Boy 2nd (=1 if second child was a boy) | 0.513 (0.500) |
| Two boys (=1 if first two children were boys) | 0.266 (0.442) |
| Two girls (=1 if first two children were girls) | 0.239 (0.427) |
| Same sex (=1 if first two children were the same sex) | 0.506 (0.500) |
| Age | 30.393 (3.386) |
| Age at first birth (parent's age in years when first child was born) | 20.832 (2.921) |
| Worked for pay (=1 if worked for pay in year prior to census) | 0.528 (0.499) |
| Weeks worked (weeks worked in year prior to census) | 19.018 (21.867) |
| Hours/week (average hours worked per week) | 16.699 (18.335) |
| Labor income (labor earnings in year prior to census, in 1995 dollars) | 6,250 (10,211) |
| Observations | 254,654 |

**TABLE 3-OLS AND 2SLS ESTIMATES OF LABOR-SUPPLY MODELS**

| | Worked for pay | | | | Weeks worked | | | |
|---|---|---|---|---|---|---|---|---|
| | OLS | Cov Adjusted | Manual 2SLS | IVReg | OLS | Cov Adjusted | Manual 2SLS | IVReg |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| More than 2 children | -0.167*** | -0.120 | -0.120*** | -0.120** | -8.045*** | -5.401 | -5.401*** | -5.401*** |
| | (0.002) | | (0.028) | (0.028) | (0.087) | | (1.225) | (1.208) |
| Age | 0.023*** | | 0.022*** | 0.022*** | 1.334*** | | 1.254*** | 1.254*** |
| | (0.0003) | | (0.001) | (0.001) | (0.013) | | (0.040) | (0.039) |
| Age at first birth | -0.029*** | | -0.026*** | -0.026*** | -1.357*** | | -1.242*** | -1.242*** |
| | (0.0004) | | (0.001) | (0.001) | (0.016) | | (0.056) | (0.055) |
| Black | 0.193*** | | 0.190*** | 0.190*** | 10.834*** | | 10.655*** | 10.655*** |
| | (0.004) | | (0.005) | (0.004) | (0.195) | | (0.216) | (0.212) |
| Hispanic | -0.008* | | -0.014** | -0.014** | -0.043 | | -0.377 | -0.377 |
| | (0.004) | | (0.005) | (0.005) | (0.180) | | (0.239) | (0.236) |
| Other race | 0.047*** | | 0.044*** | 0.044*** | 2.827*** | | 2.701*** | 2.701*** |
| | (0.005) | | (0.005) | (0.005) | (0.208) | | (0.219) | (0.216) |
| Boy 1st | 0.0005 | | 0.001 | 0.001 | -0.048 | | -0.023 | -0.023 |
| | (0.002) | | (0.002) | (0.002) | (0.084) | | (0.086) | (0.085) |
| Boy 2nd | -0.005*** | | -0.005** | -0.005** | -0.172** | | -0.152* | -0.152* |
| | (0.002) | | (0.002) | (0.002) | (0.084) | | (0.085) | (0.084) |
| Same sex | | | 0.0693 | | | | 0.0693 | |
| (first stage) | | | (0.0018) | | | | (0.0018) | |
| *N* | 254,654 | 254,654 | 254,654 | 254,654 | 254,654 | 254,654 | 254,654 | 254,654 |
| $R^2$ | 0.050 | | 0.026 | 0.048 | 0.070 | | 0.040 | 0.066 |
| Adjusted $R^2$ | 0.050 | | 0.026 | 0.048 | 0.069 | | 0.040 | 0.066 |
| F Statistic (df = 8; 254645) | 1,677.505*** | | 845.420*** | | 2,378.127*** | | 1,330.530*** | |

*Notes:*

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

**TABLE 4-OLS AND 2SLS ESTIMATES OF LABOR-SUPPLY MODELS**

| | Hours worked per week | | | | Labor income | | | |
|---|---|---|---|---|---|---|---|---|
| | OLS | Cov Adjusted | Manual 2SLS | IVReg | OLS | Cov Adjusted | Manual 2SLS | IVReg |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| More than 2 children | -6.022*** | -4.830 | -4.830*** | -4.83*** | -3,165.65*** | -1,344.811 | -1,344.811** | -1,344.811** |
| | (0.074) | | (1.027) | (1.014) | (40.597) | | (573.311) | (569.149) |
| Age | 0.819*** | | 0.783*** | 0.783*** | 528.221*** | | 472.916*** | 472.916*** |
| | (0.012) | | (0.033) | (0.033) | (6.177) | | (18.428) | (18.294) |
| Age at first birth | -1.296*** | | -1.245*** | -1.245*** | -334.987*** | | -255.741*** | -255.741*** |
| | (0.013) | | (0.047) | (0.046) | (8.198) | | (26.302) | (26.116) |
| Black | 9.727*** | | 9.646*** | 9.646*** | 6,217.592*** | | 6,094.567*** | 6,094.567*** |
| | (0.165) | | (0.181) | (0.178) | (108.876) | | (116.576) | (115.615) |
| Hispanic | 1.127*** | | 0.977*** | 0.977*** | 112.746 | | -116.790 | -116.790 |
| | (0.161) | | (0.208) | (0.205) | (87.258) | | (113.911) | (113.112) |
| Other race | 3.618*** | | 3.561*** | 3.561*** | 2,271.332*** | | 2,184.531*** | 2,184.531*** |
| | (0.185) | | (0.193) | (0.191) | (116.035) | | (120.550) | (119.887) |
| Boy 1st | 0.044 | | 0.056 | 0.056 | 12.121 | | 29.275 | 29.275 |
| | (0.070) | | (0.072) | (0.071) | (39.351) | | (40.204) | (39.911) |
| Boy 2nd | -0.148** | | -0.139* | -0.139** | -28.963 | | -15.141 | -15.141 |
| | (0.070) | | (0.072) | (0.071) | (39.317) | | (39.947) | (39.658) |
| Same sex | | | 0.0693 | | | | 0.0693 | |
| (first stage) | | | (0.0018) | | | | (0.0018) | |
| *N* | 254,654 | 254,654 | 254,654 | 254,654 | 254,654 | 254,654 | 254,654 | 254,654 |
| $R^2$ | 0.064 | | 0.041 | 0.063 | 0.056 | | 0.035 | 0.049 |
| Adjusted $R^2$ | 0.064 | | 0.041 | 0.063 | 0.056 | | 0.035 | 0.049 |
| F Statistic (df = 8; 254645) | 2,183.674*** | | 1,353.731*** | | 1,886.355*** | | 1,155.902*** | |

*Notes:*

***Significant at the 1 percent level.

**Significant at the 5 percent level.

*Significant at the 10 percent level.

From the 2SLS results showed on tables 3 and 4, one can infer that, holding all else fixed, having more than two children is associated with: (i) a 12 percentage points decrease in the probability of working for pay; (ii) a 5.401 units decrease in the amount of weeks worked in an year; (iii) a 4.83 units decrease in the amount of hours worked per week; and (iv) a $ 1,344.811 decrease in labor income per year.

Among other cases, a researcher will encounter problems in OLS regressions when dealing with reverse causality since it violates either the zero conditional-mean or the no serial correlation assumption. In this particular case, the authors briefly mention that some papers on labor supply often treat child-status variables as regressors in hours of work equations, while economic demographers discuss regressions and models to measure the impact of wages or measures of labor-force attachment on fertility. So, according to the reasearch topic, these variables can be included in the models as regressands or regressors, indicating that they are simultaneously determined – what would most likely make the dependent variable to be correlated with the error term leading to biased and inconsistent estimators when using OLS.

The endogeneity problem described above can be addressed by using instrumental variables. Under the assumptions of instrument relevance (the instrumental variable being correlated with the reggressor) and instrument exogeneity (the instrumental variable being uncorrelated with the error term, so only affecting the regressand indirectly thru the regressor), a researcher can exploit the variation in the endogenous variable that is induced by the instrument and use its fitted values as a exogenous regressor in the model. Under the assumptions previously stated, the estimator provided by the second moment equation will converge to the “true” parameter as the sample size increases.

When comparing 2SLS estimators with OLS ones, we found that the coefficients share the same sign, but is smaller (less negative) in magnitude when using an instrumental variable. This particular result, however, can’t be extrapolated to all endogeneity cases, since it depends on the sign of the correlation between the error term and the regressand, and on the sign of the correlation between the error term and the regressor.

We can observe from columns 3 and 4 that when manually computing the 2SLS estimator, the coefficients are the same from those calculated by using the ivregression function, but the standard errors are usually different. This difference was expected, since when manually running the second stage regression, we don’t take into account the fact that we are using an estimated regressor. The ivregression function already accounts for that problem and corrects the standard error, so it can be used for inference.

When comparing point estimates yielded by 2SLS (column 4) with covariate adjusted IV (column 2), we can see that they are both identical. However, the covariate adjusted IV estimate doesn’t give a standard error, which is fundamentally necessary for a researcher in order to a make inference.