Fertility and Parental Labor Supply in Rural Northwestern China — Evidence from Twin Births

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Abstract

This paper uses twin births as an instrumental variable to identify the effects of fertility on parental labor supply in rural northwestern China. Results show that having an additional child shifts mothers' labor supply substantially from wage employment (a 59% reduction in yearly labor days) to farm work (a 32% increase); fathers' labor supply is much less responsive to increases in fertility.

Keywords: Fertility; Labor supply; Twin births; Instrumental variable; China

JEL Code: J13 J22

I. Introduction

How family configuration affects family members' labor-market engagement has been a central question in labor economics. While a strong association between fertility and parental labor supply has been widely-documented, this association may not be *causal*—there may be unobservable factors (e.g., fertility preference) affecting one's fertility and labor-supply decisions simultaneously. This paper exploits twin births as an instrumental variable (IV) to identify the effects of fertility on parents' time allocated in different work activities (farming, wage work, self-employment, and housework) in rural northwestern China.

Rural China provides an interesting case to study. During China's transition to a market-oriented economy, the structure of its rural labor market has undergone profound transformations (Li et al., 2017). Even though off-farm employment had become an important source of household income in the early 2000s, there remained barriers to off-farm labor supply in rural China (Bowlus and Sicular, 2003). While many determinants

of/barriers to off-farm labor supply, such as education (de Brauw et al., 2002), macroeconomic fluctuations (Zhang et al., 2001), and industrial upgrading (Li et al., 2012), have been identified, few have scrutinized the role of fertility.

Using data on 1,495 rural households randomly selected from China's Gansu province, our IV estimation suggests that having an additional child shifts mothers' labor supply from wage employment (a 59% reduction in yearly labor days) to farming (a 32% increase). Fathers' labor supply is much less responsive to changes in fertility.

II. Method

We estimate the fertility-labor supply relationship based on the following model:

$$\log(H_{ijk}) = \beta_{0j} + \beta_{1j} \times NumChild_{ik} + \boldsymbol{F}_{ijk}\boldsymbol{\beta}_{2j} + V_{jk} + u_{ijk}, \quad (1)$$

where H_{ijk} is the number of yearly labor days (—one labor day=8 working hours) the i^{th} father/mother in village k spent performing activity j (j=farming, wage employment, etc.); $NumChild$ is the number of children under age 18 in the family; $\boldsymbol{F}$ denotes family characteristics, including father's and mother's education, father's/mother's age, maternal age at first birth, and per capita landholding; V denotes village fixed effects (FE), included to control for factors varying at the village level (e.g., farm input prices and wage); the error term u captures the influence of unobserved factors.

If equation (1) is well-specified, $\beta_{1j}'s$ measure the causal effects of fertility on parental labor supply and can be estimated by ordinary least-squares (OLS) regressions. However, OLS estimates will be biased if $NumChild$ is correlated with unobserved predictors for labor supply (e.g., preference). Following Jacobsen et al. (1999), Cáceres-

Delpiano (2012), and Baranowska-Rataj & Matysiak (2016), among others, we address endogeneity in fertility by using an indicator of twin births ($Twins$) to instrument $NumChild$. Specifically, we estimate equation (1) jointly with the following first-stage equation:

$$\widehat{NumChild} = \hat{\alpha}_0 + \hat{\alpha}_1 \times Twins + \boldsymbol{F}\hat{\boldsymbol{\alpha}}_2 + \hat{V}, \qquad (2)$$

in a two-stage least-squares (2SLS) framework.

III. Data

We estimate equations (1)-(2) using data from the Gansu Survey of Children and Families. The survey, adopting a stratified random sampling strategy, selected 2,000 rural families (=20 counties×5 villages×100 families) with children aged 9-12 in 2000 from all non-urban, non-Tibetan counties in Gansu.[1] It then collected information on the targeted children, their families, and village leaders. Subsequent waves were conducted in 2004, 2007, 2009, and 2015.

We analyze data from Wave 2 (conducted in 2004) because, at that time, the families had presumably completed their fertility cycle while most of their children were not yet adults (—average child age=14). The analytical sample includes 1,495 mothers under age 45 (whose children were all under age 18) and their husbands.

[1] Located in northwestern China, Gansu is among the poorest in China. In 2004, its rural per capita net disposable income ranked 30 out of 31 provinces (National Bureau of Statistics, 2005). Three-fourths of its 25.4 million population were residing in rural areas in 2004.

Table 1 depicts the profile of these parents. Most of the mothers are poorly-educated, spending most of their time on housework and farming. In comparison, fathers (who are slightly better-educated) devoted much more time to paid work. Consistent with previous findings, 2.3% of these parents experienced twin births (—identified when two children in a family have the same birth year and month).

IV. Results

Table 2 reports our main results. Panel A presents the estimated fertility effects on mothers' time allocated in four work activities (farming, wage work, self-employment, and housework). Note first that OLS and IV estimates usually differ in sign or size, suggesting potential endogeneity in fertility.[2] 2SLS estimates indicate that having an additional child shifts mothers' labor supply substantially from wage work (column 2: a 59.2% ($= e^{0.465} - 1$) reduction in yearly labor days) to farm work (column 4: a 32.0% ($= e^{-0.385} - 1$) increase). Although a similar pattern is observed for fathers (Panel B), fathers' labor-supply responses to changes in fertility are limited. For both parents, time devoted to self-employment (column 6) and housework (column 8) is not responsive to changes in fertility.

Effects of other variables are also informative. More education pushes fathers out of agriculture (column 2) to seek paid jobs (column 4); it also enhances mothers' entrepreneurship (column 6). More land endowment, however, keeps mothers (but not fathers) on-farm longer.

[2] Hausman endogeneity tests indicate that the differences between OLS and IV estimates are statistically significant for farming (F-stat=6.80, p=0.01) and wage employment (F-stat=3.09, p=0.08).

To strengthen our findings, we performed a series of checks. First, first-stage regressions (Table A1, columns 1-2) reveal little evidence of our twin-birth IV being weak (Bound et al. 1995)—F-statistics for testing the significance of the IV, 73.23 in column (1) and 70.44 in column (2), both exceed the rule-of-thumb value of 10 (Staiger and Stock, 1997). Second, we assessed the exogeneity of twin births by regressing the twin-birth dummy on a set of observed household characteristics. If twin births are indeed out of parental control, they should not be predicted by these characteristics. As Table A1 shows, none of these characteristics predicts twin births, whether separately in bivariate regressions (column 3) or jointly in a multivariate regression (column 4).

Alternative specifications were also considered. First, to address the potential correlation between twin births and high-order births, we replaced the IV with dummies for twin births in the first two parties. Second, we included child characteristics (i.e., average age, average years of schooling, and the fraction of girls) in the model. Third, we added household and farm assets. Finally, we expanded the sample to include mothers under age 55 and their husbands. As shown in Table 3, none of these altered the fertility-labor supply relationship discussed above.

V. Conclusion

Using twin births as a natural experiment, we found that having more children shifts mothers' labor supply substantially from wage employment to farming in rural northwestern China, suggesting fertility as a barrier to female off-farm labor supply. By contrast, fathers' labor supply is much less responsive to changes in fertility.

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Table 1: Summary Statistics

	Mothers		Fathers	
	Mean	SD	Mean	SD
(Log) Yearly labor days devoted to:				
Farming	4.574	(1.354)	3.937	(1.766)
Wage employment	0.449	(1.750)	3.131	(3.626)
Self-employment	0.314	(1.177)	0.741	(1.750)
Housework	3.180	(0.562)	1.888	(1.019)
Education (years)	4.220	(3.022)	6.579	(2.936)
Age (years)	37.700	(2.656)	39.916	(3.501)
Maternal age at first birth (years)	21.648	(2.300)		
Twin births	0.023	(0.147)		
Number of children	2.233	(0.652)		
Per capita landholding (*mu*)	2.525	(1.746)		

Note. One *mu*=1/15 hectare. *N*=1,495.

Table 2: Estimated effects of fertility on parental labor supply

(Log) Yearly labor days devoted to:	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Farming		Wage employment		Self-employment		Housework	
	OLS	2SLS	OLS	2SLS	OLS	2SLS	OLS	2SLS
	A. Mothers (≤ age 45; all children ≤ age 18)							
Number of children	0.217***	0.465***	-0.050	-0.385**	-0.105**	0.111	0.084***	0.029
	(0.048)	(0.096)	(0.073)	(0.164)	(0.053)	(0.213)	(0.026)	(0.078)
Mother's education	-0.023*	-0.019	0.011	0.006	0.028**	0.032***	-0.001	-0.002
	(0.014)	(0.014)	(0.022)	(0.021)	(0.012)	(0.012)	(0.008)	(0.008)
Father's education	-0.008	-0.008	0.017	0.017	0.022**	0.022**	0.013	0.013
	(0.014)	(0.013)	(0.016)	(0.016)	(0.011)	(0.011)	(0.009)	(0.009)
Mother' s age	0.001	-0.024	-0.026	0.008	-0.021	-0.043	-0.004	0.001
	(0.018)	(0.020)	(0.027)	(0.033)	(0.017)	(0.027)	(0.011)	(0.014)
Maternal age at first birth	0.011	0.039*	-0.033	-0.070*	0.016	0.040	0.008	0.002
	(0.021)	(0.022)	(0.033)	(0.040)	(0.018)	(0.031)	(0.014)	(0.016)
Per capita landholding	0.310***	0.371***	-0.084	-0.166	-0.116	-0.063	0.059	0.046
	(0.090)	(0.094)	(0.105)	(0.105)	(0.076)	(0.087)	(0.045)	(0.042)
R^2	0.329	0.317	0.150	0.139	0.317	0.147	0.235	0.233
	B. Fathers (husbands of A)							
Number of children	0.044	0.262	-0.260*	-0.167	0.004	-0.211	-0.040	0.035
	(0.072)	(0.250)	(0.147)	(0.623)	(0.077)	(0.256)	(0.045)	(0.201)
Mother's education	-0.036**	-0.033*	0.088**	0.090**	0.001	-0.001	-0.014	-0.013
	(0.018)	(0.018)	(0.039)	(0.039)	(0.018)	(0.016)	(0.013)	(0.013)
Father's education	-0.047***	-0.049***	0.071**	0.070**	0.026	0.028*	-0.021**	-0.021**
	(0.017)	(0.016)	(0.032)	(0.031)	(0.016)	(0.016)	(0.009)	(0.009)
Father' s age	0.021*	0.016	-0.025	-0.028	-0.025**	-0.020	-0.005	-0.007
	(0.011)	(0.012)	(0.028)	(0.031)	(0.012)	(0.013)	(0.009)	(0.010)
Maternal age at first birth	0.031	0.039*	-0.112**	-0.108**	0.029	0.021	0.016	0.019
	(0.021)	(0.021)	(0.046)	(0.049)	(0.020)	(0.020)	(0.016)	(0.017)
Per capita landholding	0.078	0.130	0.108	0.130	-0.179*	-0.231*	-0.052	-0.034
	(0.111)	(0.117)	(0.210)	(0.251)	(0.107)	(0.130)	(0.082)	(0.086)
R^2	0.304	0.299	0.226	0.226	0.234	0.229	0.290	0.289

Notes. *N*=1,495 for all models. All models include a constant term and village FEs.
Robust standard errors in parentheses, adjusted for intra-village clustering.
*** p<0.01, ** p<0.05, * p<0.1

Table 3: 2SLS Estimates of fertility effects on parental labor supply

(Log) Yearly labor days spent on:	Mothers				Fathers			
	Farming	Wage work	Self-employed	Housework	Farming	Wage work	Self-employed	Housework
IVs: Twin births in 1st two parities	0.513***	-0.393**	0.151	0.099	0.183	-0.153	-0.176	-0.023
	(0.098)	(0.182)	(0.262)	(0.089)	(0.344)	(0.766)	(0.311)	(0.248)
Child characteristics added	0.505***	-0.449**	0.168	0.023	0.347	-0.274	-0.180	0.089
	(0.117)	(0.197)	(0.246)	(0.090)	(0.278)	(0.704)	(0.275)	(0.227)
Household & farm assets added	0.392***	-0.426***	0.174	0.037	0.118	-0.139	-0.139	-0.005
	(0.104)	(0.164)	(0.204)	(0.079)	(0.258)	(0.627)	(0.254)	(0.205)
Sample: "mother's age ≤ 55"	0.471***	-0.387**	0.107	0.029	0.287	-0.194	-0.218	0.049
(*N*=1,536)	(0.091)	(0.157)	(0.211)	(0.077)	(0.247)	(0.260)	(0.624)	(0.199)

Notes. *N*=1,495.
Standard errors in parentheses, adjusted for intra-village clustering.
*** p<0.01, ** p<0.05

Appendix

Table A1. Correlations between twin births and other variables

	(1)	(2)	(3)	(4)
Variables	Number of children		Twin births	
			Bivariate regressions	Multivariate regression
Twin births	0.842***	0.870***		
	(0.099)	(0.104)		
Mother's education	-0.015**	-0.013**	0.000	-0.001
	(0.006)	(0.006)	(0.001)	(0.002)
Father's education	0.000	0.007	0.001	0.001
	(0.006)	(0.006)	(0.001)	(0.001)
Mother's age	0.099***		-0.000	0.002
	(0.010)		(0.001)	(0.003)
Mother's age at 1st birth	-0.111***	-0.037***	-0.000	0.000
	(0.011)	(0.008)	(0.001)	(0.003)
Father's age		0.024***	-0.001	-0.001
		(0.005)	(0.001)	(0.001)
Per capita landholding	-0.229***	-0.222***	-0.001	-0.001
	(0.054)	(0.056)	(0.005)	(0.005)
Constant	0.760**	1.837***		-0.014
	(0.305)	(0.275)		(0.067)
Village FE	Yes	Yes	No	No
R^2	0.321	0.276		0.002

Notes: *N*=1,495.

Robust standard errors in parentheses, adjusted for intra-village clustering.

*** p<0.01, ** p<0.05.