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LABOR FORCE PARTICIPATION IN IRAN

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Abstract

Despite the rapid rise of women's education and the fall of their fertility rates in Iran, female labor force participation remains low. This paper uses twins at first birth as an instrumental variable to estimate the impact of number of children on mothers' participation in the labor market in Iran. It finds that every additional child reduces participation of mothers in urban areas by about 2 percentage points. No effect is found in rural areas. Implications are discussed.

JEL Classification: J13, J22, O53

Keywords: Female labor force participation, Fertility, Iran, Twins, Instrumental variable

ملخص

على الرغم من الارتفاع السريع لمعدلات تعليم المرأة وسقوط معدلات الخصوبة في إيران، لا تزال مشاركة المرأة في القوى العاملة متدنية. وتستخدم هذه الورقة التوائم عند الولادة الأولى كمتغير أساسي لتقدير تأثير عدد الأطفال على مشاركة الأمهات في سوق العمل في إيران. وجدت أن كل طفل إضافي يقلل من مشاركة الأمهات في المناطق الحضرية بنحو 2 نقطة مئوية. لم يتم العثور على أي أثر في المناطق الريفية. وتناقش الآثار المترتبة عليها.

1. Introduction

The puzzle of female labor force participation (FLFP) in Iran has been extensively discussed in the literature (see Majbouri 2010, 2015a). Women's participation rates have remained almost constant at less than 20% in the last three decades[1], despite the fact that their education has been continuously rising and their fertility rates declining. For example, total fertility rates have fallen from about 6.5 in 1984 to 2 children per woman in 2002 (Salehi-Isfahani et al. 2010).[2]

This stylized fact makes the objective of this study, which is identifying the impact of number of children on FLFP, particularly interesting. Does the number of children reduce the chance of mothers' participation in Iran as found elsewhere (see Jacobsen et al. 1999 for the US)? The answer to this question is unknown in advance and the result can be surprising. Moreover, it sheds light on one aspect of the puzzle of FLFP in Iran. This becomes more interesting as the stylized fact and the puzzle mentioned above are shared across Middle East and North Africa (MENA)[3]. Moreover, it is shown that lowering barriers to female participation in (at least some) MENA countries considerably increases economic growth (Stella et al. 2013).

The main problem in identifying the impact of number of children on mothers' labor force participation (LFP) is that they are jointly determined and hence, endogenous. Following the seminal work by Rosenzweig and Wolpin (1980) and subsequent work by Jacobsen et al. (1999), this study uses multiple births (twins, triplets, etc.) at first birth as an instrumental variable and shows that the number of children reduces FLFP for mothers in urban by about 2 percentage points. The result in rural areas has the same size but is insignificant.

FLFP in Iran has been studied in the past. Salehi-Isfahani (2005) was the first paper trying to understand the effect of fertility and education on FLFP using a reduced form. Esfahani and Shajari (2012) use urban vs. rural place of birth as an instrument for women's education and find that education increases FLFP modestly.[4] Azimi (2015) estimated the effect of the number of children on FLFP using son-preference as the instrumental variable and finds no significant effect of fertility on FLFP. But that instrument may not satisfy the exclusion restriction, as households with son-preference may not have favorable views towards women's labor market participation as well. This study, however, uses multiple first birth as an instrument which does not have this issue.

2. The Econometric Model and The Data

The econometric model can be written as

$$LFP_i = \alpha_0 + \beta N_i + f(AFB_i) + \sum_{j=1}^{l} \alpha_j D_i^j + e_i \tag{1}$$

in which LFP_i is the labor force participation (LFP) for mother i, and N_i is the number of children she has. AFB_i is the age of mother i at the first birth, and $f(AFB_i)$ is the third degree polynomial function of AFB_i. D_i^j is a dummy variable, equal to one if mother i partially or fully completed education level j (as her last education level) and zero, otherwise. *Primary, middle school*, *high school*, and *college & above* are the four education levels included in the regression (illiterates are the excluded category.) N_i is endogenous and the OLS estimate of β is biased. But, one can use giving multiple births in the first birth (twins, triplets, or higher orders; *twins* from now on) as an instrument for N_i.

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[1] Participation rates for women aged 20 to 65 has been about 15% in urban areas and fluctuating around 22% in rural areas.

[2] Also, the average years of schooling for 20 to 30 year-old women rose by more than 8 years between 1970 and 2010 (Data Source: Barro and Lee 2013).

[3] See World Bank (2004) for a thorough discussion of low FLFP in the Middle East and North Africa.

[4] Esfahani and Shajari (2012) also offered reduced form estimations of FLFP. Majbouri (2015b) estimates a structural model of female labor supply.

Having twins at first birth rather than twins in general is used as an instrument, because mothers with twins at higher order births have already decided to have more kids and are different from the sample of all mothers (Rosenzweig and Wolpin 1980). Having a twin at first birth, however, is not exogenous to FLFP. Medical literature has shown that the probability of having twins at first birth is related to mother's age at first birth (Mittler 1971). Age is also correlated with FLFP which is the outcome of interest in this study. But, if one controls for age at birth, having twins becomes random, and exogenous to mother's participation (Rosenzweig and Wolpin 1980). Therefore, Equation (1) controls for a polynomial of age at first birth.

One potential source of bias that is not (fully) captured by mother's age is the use of infertility treatments, such as In-Vitro Fertilization (IVF) and drug treatment with clomiphene citrate, which increases the chance of giving birth to twins (e.g., Callahan et al., 1994; Gleicher et al., 2000; Fauser et al., 2005). But, Braakmann and Wildman (2014) show that the bias, that is caused by not controlling for infertility treatments, is small. In the absence of data, it is hard to account for the use of these treatments. But, controlling for mother's education which is correlated with the use of these treatments is a typical solution that is implemented in Equation (1).

To estimate Equation (1), this study uses the 2% sample of the 2011 population census in Iran, collected by Statistical Center of Iran (SCI). SCI is the official entity in Iran that gathers surveys, and offers compiled and raw data sets on various topics, such as population, and the economy, for more than six decades. The Iranian population census has been collected every ten years since 1946. There are nearly 1.5 million individuals and over 0.4 million households in this data set. Table A1 in the Appendix has more information about all households, their compositions, and shares in the data.

Following Jacobsen et al. (1999), the sample in this study only contains mothers in households that 1) have one mother, her husband, and the mother's own children, 2) the number of children present in the household is equal to the number of children ever born by the mother, and 3) the age of the first child is less than 18. The first condition is because other compositions of households, like households with multiple spouses, or those with extended family (grandparents, in-laws, etc.) have different resources available and may respond differently to an exogenous increase in the number of children. The last two conditions are to make sure that we capture the first-birth twins accurately. We may not be able to identify first-birth twins correctly, if the real composition of household is not the one we observe in the data and that is more likely the case if the last two conditions do not hold. This sample has 129,619 mothers (or households) for which all variables used in regressions are non-missing.

Multiple births are identified as those who have the same mother, birth year and birth month[5]. There are 2139 twins, 61 triplets, and 5 quadruplets in the sample. Out of those, 1271 twins, 41 triplets, and 5 quadruplets were born in the first birth (1317 total). *First-birth twin* is a dummy that is equal to one if the first birth was a multiple birth and zero otherwise. Table 1 contains the summary statistics of all variables that are used in this study for the sample of mothers with first-birth twins and non-twins. LFP is a dummy that is equal to one if the individual reported either of the following: 1) working in the last seven days, 2) working as unpaid family labor, 3) has a job but, has not worked in the last seven days for temporary reasons, 4) were looking for a job in the last thirty days, 5) waiting for her new work to start, or 6) waiting to go back to her old work. It is equal to zero if the individual is in any of the following circumstances: 1) studying, 2) homemaker, 3) has income but without working, or 4) other circumstances. Urban is a dummy that is equal to one if the household lives in an urban area and zero otherwise.

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[5] One should make sure not to count observations with missing values for birth year or birth month as twins.

Educational levels are only identified at the schooling level: primary, middle school, high school, and college and above.

Since the minimum and maximum age of mothers with twins are 17 and 56, all regressions are estimated for sample of mothers in this age range, so that non-twined mothers would be comparable to twined mothers. We lose fewer than 200 observations (less than 0.2% of the sample). Observations in rural and urban areas in each province are clustered and correlation within each cluster is controlled for in all regressions. There are 30 provinces, hence, 60 clusters.

3. Results

The OLS coefficient of the number of children in Equation (1) is reported in Table 2. As depicted, number of children has a statistically significant but positive correlation with mother's LFP for urban mothers only. One more child is associated with 1.9 percentage points more participation. This interesting positive coefficient is because mothers in poorer households have more kids and are also more likely to work; one possible reason that the OLS estimate is biased.

Table 3 shows the first and the second stages of the 2SLS estimates of Equation (2) for various samples.[6] The results show causal effect of number of children on FLFP. Having more children in urban areas reduces participation only for urban mothers by about 2 percentage points. Interestingly, this result is in the opposite direction of the OLS estimates in Table 2, showing that the true effect of children on LFP is negative. Another interesting point is that the effects are large considering the fact that urban mothers' participation rate is only 13.2%.

Jacobsen et al. (1999) and Rosenzweig and Wolpin (1980) found 1.5 and 2.4 percentage points reduction in American mothers' participation, respectively.[7] The result for Iran is well within this range. The rural and urban results are similar in magnitude, but insignificant in rural areas. One reason could be that rural mothers have a convenient access to network of extended family living nearby and can use their help in child care.

These results raise the question as to why participation rates were not increasing when fertility rate was declining in the last three decades. One explanation is that the true negative impact of number of children on FLFP is a local average treatment effect to an exogenous shock to fertility. In other words, this is the response of mothers to an unplanned rise in fertility. But the fall in fertility in the last three decades was carefully planned by households. This planned fertility may have no impact on participation since it is endogenous and jointly determined (in fact, the correlation is positive.)

The result of this study is particularly interesting as the Iranian government has recently reversed its population control policy and is now advocating larger family sizes. For instance, the government has stopped offering free contraception to rural households. If this sharp reversal increases unplanned fertility, this study shows that it will reduce FLFP rate in the future.

4. Conclusion

This paper illustrates that having more children reduces participation of Iranian urban mothers by about 2 percentage points. The coefficients are in the opposite direction of the OLS estimates suggesting substantial omitted variable bias. One policy implication is that child care subsidy may increase women's participation in urban areas but has no effect in rural areas. Considering the many similarities between Iran and MENA countries in women's work, this result may be expandable to MENA region. Further research is required.

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[6] The same results are found using GMM estimation.

[7] Jacobsen et al. (2001) uses twins to estimate the effect of child bearing on mothers' marital status.

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Table 1: Summary Statistics of the Sample of Mothers

Variable	Non-twins					First-Birth Twins				
	Obs.	Mean	St. dev.	Min	Max	Obs.	Mean	St. dev.	Min	Max
Age	128,302	31.08	6.05	11	87	1,317	31.86	6.11	17	56
Literate	128,302	0.93	0.25	0	1	1,317	0.93	0.25	0	1
Primary	128,302	0.22	0.41	0	1	1,317	0.15	0.355	0	1
Middle school	128,302	0.20	0.40	0	1	1,317	0.17	0.378	0	1
High school	128,302	0.35	0.48	0	1	1,317	0.40	0.491	0	1
College & above	128,302	0.17	0.37	0	1	1,317	0.21	0.407	0	1
Urban	128,302	0.74	0.44	0	1	1,317	0.8	0.4	0	1
First child age	128,302	7.95	4.81	1	17	1,317	6.97	4.47	1	17
Age of mother at the first birth	128,302	23.13	4.60	10	86	1,317	24.89	4.88	12	50
Second child age	65,078	6.42	3.97	1	17	1,317	6.97	4.47	1	17
Age of mother at the second birth	65,078	26.93	4.79	11	76	1,317	24.89	4.88	12	50
Children ever born	128,302	1.75	0.83	1	10	1,317	2.39	0.78	2	10
Labor Force Participation	128,302	0.11	0.31	0	1	1,317	0.13	0.33	0	1

Note: The individuals in the sample are mothers in households that 1) have only one mother, her husband, and the mother's own children (no mother's step-child, another spouse, or any extended family member), 2) the number of children present in the household is equal to the number of children ever born by the mother, and 3) the age of the first child is less than 18. These last two conditions are to make sure that we capture first-birth twins accurately. Literate is a dummy equal to one if the individual is literate and zero otherwise. Primary, Middle school, High school, and College & above are dummies equal to one if the individual completed or partially completed the corresponding education level. Urban is a dummy equal to one if the individual lives in urban area and zero otherwise. Labor force participation is a dummy equal to one if the individual had a job or was unemployed but was looking for a job in the last thirty days.

Table 2: OLS Estimates of the Effect of Number of Children on Mother's LFP

	17 to 56 Years Old		
	All	Rural	Urban
Number of children	0.013***	0.002	0.019***
	(0.001)	(0.001)	(0.001)
Observations	129,433	33,952	95,481
Adjusted R-squared	0.232	0.068	0.250

Note: The dependent variable is a dummy that is equal to one if the individual (mother) has a job or is looking for a job in the last 30 days and zero otherwise. Age of the mother at first birth and its squared and cubed as well as dummies for mother's level of education (primary, middle school, high school, and college & above) are controlled for in these regressions. Robust-heteroskedastic standard errors corrected for correlation within clusters are in the parentheses. Clusters are rural and urban areas in each province. There are 30 provinces, hence, 60 clusters. *** p<0.01, ** p<0.05, * p<0.10

Table 3: Two-Stage Least Squares Estimates of the Effect of Number of Children on Mother's LFP (First-birth twin is the instrument)

	17 to 56 Years Old					
	All		Rural		Urban	
Variable	First Stage	Second Stage	First Stage	Second Stage	First Stage	Second Stage
First-birth twin	0.732***		0.788***		0.717***	
	(0.020)		(0.061)		(0.019)	
Number of children		-0.019**		-0.020		-0.021**
		(0.009)		(0.023)		(0.010)
First-Stage F-test	1375.1***		158.7***		1409.7***	
Average LFP Rate (in %)		11.1		5.3		13.2
Average Number of Children		1.76		1.93		1.7
Observations	129,433	129,433	33,952	33,952	95,481	95,481

Note: The dependent variable in the first stage is the number of children. The dependent variable in the second stage is a dummy that is equal to one if the individual (mother) has a job or is looking for a job in the last 30 days and zero otherwise. Age of the mother at first birth and its squared and cubed as well as dummies for mother's level of education (primary, middle school, high school, and college & above) are controlled for in these regressions. Robust-heteroskedastic standard errors corrected for correlation within clusters are in the parentheses. Clusters are rural and urban areas in each province. There are 30 provinces, hence, 60 clusters.
*** $p<0.01$, ** $p<0.05$, * $p<0.10$

Appendix

Table A1: Types and Number of Households in the 2011 Census

	Number	Share out of all households with head (in %)
All Households	423,637	
without head	1,303	
with head	422,334	100
but no spouse	68,341	16.2
and one spouse	353,001	83.6
and more than one spouse	992	0.2
Households with head living with		
sons or daughter-in-laws of the head	6,312	1.5
parents of head or spouse	10,329	2.5
siblings of head or spouse	5,904	1.4
other relatives and non-relatives	2,542	0.6
Households with a mother and her husband	274,382	
and head's children (no other member)	266,046	
and mother's children (no other member)	259,452	
Sample of this study*	129,619	

Note: This table contains the number of households in the census based on the composition of the household. There are 1,481,586 individuals in the data. Only 0.4 percent of them (5,840) are living in households without head. Households without head are those in which individuals are not related to each other, like migrant workers who live in the same dwelling. This study only focuses on households that have a head and one spouse but do not have any other member except children. These households may not have children at all.

* The sample of this study contains households that 1) have only one mother, her husband, and the mother's own children (no mother's step-child, another spouse, or any extended family member), 2) the number of children present in the household is equal to the number of children ever born by the mother, and 3) the age of the first child is less than 18. Only mothers in these households are studied. Therefore, the number of individuals (mothers) in the sample is the same as the number of households, i.e. 129,619. Table 1 contains summary statistics of these mothers.