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Do young children prohibit mothers from working? A study in the Amhara Region, Ethiopia

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Abstract: Theoretical work relating economic effect of children suggests that labor market participation decreases for mothers with large number of young children and increases when children are adults. The majority of empirical studies find results consistent with this expectation, but there are some studies which fail to confirm this theoretical prediction for the developing countries. This paper used data from a household survey of rural and urban married women to test the theoretical prediction that labor market participation decreases for mothers with large number of young children and increases when children are adults. Results show that when all households are considered, children seem to have positive effects on the probability of the mother's work participation. However, when household lifecycle and rural-urban location differences are considered, coefficients are negative (but not statistically insignificant) for urban households with large number of young children and positive (and statistically significant) for those households with more adult children; whereas for rural households, these coefficient signs are reversed. Results from the quantitative data combined with qualitative narratives suggest that large numbers of young children do not prohibit rural mothers from working.

Keywords: *maternal work status; Amhara region of Ethiopia; lifecycle fertility; lifecycle maternal labor supply*

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1 Introduction

Theories linking fertility to parental work, in general, view fertility as a response to the parents' demand for children relative to other components in the household's utility maximization decision. In the standard economic literature which considers children as economic goods (Becker, 1960), children are seen to be the result of parental choice relative to other essential household goods, all constrained by financial and time shortages in the household's utility maximization framework (Becker, 1960; Hotz and Miller, 1988). Given budget constraints in the household's utility maximization framework, parents have to make choices between labor market participation or childrearing (Becker, 1960; Hotz and Miller, 1988; Rosenzweig and Wolpin, 1980b). In this line of argument, therefore, the observed fertility is determined by variation in the opportunity cost of parental time in childcare (Becker, 1960; Hotz and Miller, 1988; Rosenzweig and Wolpin, 1980b). However, these static exogenous models of fertility are increasingly criticized since they ignore the inherently sequential nature of fertility and maternal labor supply decision making over the lifecycle (Adda, Dustmann and Stevens, 2011; Fehr and Ujhelyiova, 2012; Francesconi, 2002; Hotz and Miller, 1988;

Moffitt, 1984; Sheran, 2007). In a lifecycle framework, it is argued that since young children are more time intensive than adult children (Hotz and Miller, 1988; Fehr and Ujhelyiova, 2012; Moffitt, 1984), mothers may be less likely to work with an increasing number of young children and more likely to work when children are adults.

Lifecycle frameworks to fertility and labor supply decisions, which are seen to be dynamic and jointly determined, highlight the potential value of focusing on parents' preferred timing of childrearing and labor supply over the lifecycle (Francesconi, 2002; Hotz and Miller, 1988; McNicoll, 1984; Moffitt, 1984; Rosenzweig and Wolpin, 1980b; Sheran, 2007). In this framework, parents' fertility and labor market participation decisions reflect different timing preference. For example, couples may (1) prefer to have children early in their lifecycle and delay participation in the labor market, (2) participate in the labor market first delay childbearing, or (3) prefer to participate in the labor market both early and latter in their lifecycle, allocating their working ages for childrearing (Cho, 2006). The framework is, therefore, considered to be a useful tool in analyzing fertility and maternal labor supply behaviors over the lifecycle (Adda, Dustmann and Stevens, 2011; Cho, 2006; Erosa, Fuster and Restuccia, 2016; Fehr and Ujhelyiova, 2012; Francesconi, 2002; Hotz and Miller, 1988; McNicoll, 1984; Moffitt, 1984; Sheran, 2007).

However, while ample cross-national macro-level empirical evidence for the age dependency hypothesis (population level) is available, the lifecycle hypothesis (household level) is empirically little explored (see *e.g.*, Browning and Crossley, 2001; Chernichovsky, 1978; Davies, 1988; Kelley and Schmidt, 2001). In addition, despite the ample research undertaken to estimate the relationship between fertility and maternal labor participation, empirical research is complicated by the endogeneity of fertility in female labor supply decisions. Several studies have used instrumental variable estimation as a solution to this problem (*e.g.*, Aassve and Arpino, 2007; Angrist and Evans, 1998; Bloom, Canning, Fink, *et al*., 2009; Chun and Oh, 2002; Cruces and Galiani, 2007; Kim and Aassve, 2006; Kim, Engelhardt, Prskawetz, *et al*., 2009; Orbeta, 2005). The vast majority of empirical studies find results consistent with this theoretical prediction relating fertility and maternal labor participation, but there are some studies in the case of developing countries which fail to replicate the expected relationship (*e.g.*, Aghajanian, 1979 for Iran; Angrist and Evans, 1998 for references on a similar evidence for other countries; Cho, 2006 for Korea; Solomon and Kimmel, 2009 for Ethiopia).

When it comes to the context of Ethiopia, the allegedly adverse consequence of rapid population growth on economic development has been acknowledged by the national population policy and the different national development consecutive plans (IMF, 2006; Ministry of Finance and Economic Development, 2002; 2006; 2010; Transitional Government of Ethiopia, 1993; UNDP, 2001; UN Population Division, 2005). The development plans identify, among other things, maternal labor market participation as critical for achieving the planned development. One major strategy suggested by the plan documents to achieve this is ensuring balanced population and economic growth, for example, through reducing fertility.

In Ethiopia, fertility has been one of the highest among the developing countries, but substantial decline has begun in recent years (United Nations, 2017: 33). Modern contraceptive use has recently risen, for example, from 11 percent in 2000 (Central Statistical Agency of Ethiopia and ORC Macro, 2000) and 15 percent in 2005 (Central Statistical Agency of Ethiopia and ORC Macro, 2005) to 29 percent in 2010 (Central Statistical Agency of Ethiopia and ORC Macro, 2011). Correspondingly, total fertility rate is declining substantially though still high, for example, from 5.9 in 2000 (Central Statistical Agency of Ethiopia and ORC Macro, 2000) and 5.4 in 2005 (Central Statistical Agency of Ethiopia and ORC Macro, 2005) to 4.8 in 2010 (Central Statistical Agency of Ethiopia and ORC Macro, 2011). The average annual rate of population growth has also dropped from 2.9 percent during the 1984 – 1994 intercensal period to 2.6 percent during the 1994 – 2007 intercensal period (Hailemariam, Alayu and Teller, 2011; UNFPA, 2010).

However, with fertility declining much more slowly than mortality, the country is yet in the early stage of the demographic transition (Ringheim, Teller and Sines, 2009). The percentage of women working in productive activities is low (Transitional Government of Ethiopia, 1993). For example, the Ethiopian DHS 2005 (Central Statistical Agency of Ethiopia and ORC Macro, 2005) shows female participation rate to be 32 percent by the time of the survey. Apart from its implication for achievability of the planned growth and transformation, this low maternal labor supply amid falling fertility rate is interesting given the forgoing theoretical discussion regarding maternal labor market participation effect of fertility.

The question of interest to the present study, therefore, is whether and the extent to which fertility influences labor market participation of Ethiopian households. Available research regarding maternal labor market participation effect of fertility is spatially polarized, concentrating in Latin American and South and Southeast Asian countries (Aassve and Arpino, 2007).

For Ethiopia, evidence is very limited. The first published work known to the present author is by Solomon and Kimmel (2009), which sought to examine the relationship between fertility and the labor supply of the mother, and the second is by Desta (2013), which, however, examined the effect of children on maternal hours of work for working mothers, instead. As such, the available research is very inadequate to inform policy and that there is no adequate context

specific evidence for the government of Ethiopia to support or not to support policy targeted at reducing fertility rate. Formulation and implementation of sound national population and development policy and programs requires context-relevant research evidence.

Therefore, the present study uses a household sample survey dataset from rural and urban married women with at least two live children to document the effect of the number of children on work participation of Ethiopian women. It seeks to bridge the gap by examining how effect of fertility on maternal work participation varies by the different lifecycles of the household and by rural-urban location.

2 Data and methods

2.1 Data sources

Quantitative data regarding demographic, employment and other socioeconomic characteristics over the last four months prior to the commencement of the survey were collected from a sample of 493 rural and urban married mothers with at least two children living with the household, in two different time periods. First, a sample of 254 households were interviewed in October 2010, and then with the view to increasing the earlier sample size, additional 239 sample households residing in the same place as the previous sample were interviewed in 2013. The urban households were randomly selected from four kebeles (the smallest unit in the administrative structure of the country) out of the total of nine kebeles of the Bahir Dar City, the Amhara Regional State capital. Likewise, the rural sample households were randomly selected from two kebeles drawn from two different rural districts.

While, as is evident from the abundance of published articles, research on the link between fertility and maternal labor supply so far has typically been dominated by a quantitative approach, the use of qualitative approach to supplement and rectify weaknesses of the former is conspicuously missing. There is now an increasing consensus among scholars that the use of qualitative data within a quantitative one offers important value-adding advantages. Some of the value-adding advantages include its ability in improving household survey design, interpreting counter-intuitive or surprising findings from household surveys, explaining the reasons behind observed outcomes, probing motivations underlying observed behavior, suggesting the direction of causality, assessing the validity of quantitative results, understanding conceptual categories, and facilitating analysis of locally meaningful categories of social differentiation (Davis and Baulch, 2010; Hulme, 2007; Kanbur and Shaffer, 2005; Lawson, Hulme and Muwonge, 2007; Shaffer, 2012). This article used qualitative observation and interview conducted with survey households, with the view to discussing results from the quantitative data analysis, and this was found especially helpful where results from the quantitative data alone were found to be inconsistent with the theoretical expectation or with most previous evidence. An observation was made where a member or members of a household were engaged in any type of work activity for the household.

In addition, government policy and program documents were used as data source. Specifically, the national population policy document of Ethiopia and other policy and program documents related to population and development such as the Sustainable Development and Poverty Reduction Program (SDPRP), Plan of Action for Sustained Development to End Poverty (PASDEP), Growth and Transformation Plan (GTP), and other relevant sectoral policies and programs were reviewed.

With the view to assessing if the widely acknowledged rural-urban structural difference also translates into rural-urban differentials in fertility and maternal economic outcomes, data were analyzed first using the full sample and then separately for the urban and the rural sub-samples. As analytical framework, the paper also categorized the women by their children's average age groups to capture lifecycle variations in the effects.

2.2 Measurements

The objective of the present study is to investigate the effect of the number of children on the mother's (participant's) work participation. The dependent variable is the mother's participation in economic activities and the independent variable of interest is the number of children. In addition, a number of other demographic and socio-economic variables were also used as control variables, including average age of children, sex and age of the household head, participant's age at first marriage, participant's years of schooling, contraceptive use (yes = 1; otherwise, 0), loan receipt (yes = 1; otherwise, 0), members in the household other than parents engaged in productive or non-productive work, mean hours of their work, and value of household assets in term of *Ethiopian Birr* (ETB). The choice of these variables is consistent with most previous studies on the similar topic.

2.3 Analytical strategies

The causal effect of fertility on the economic wellbeing of children is complicated by their endogeneity. Although there are a few studies which failed to find endogeneity (Orbeta, 2005), the fact that fertility is endogenous to maternal work participation is widely acknowledged in the economic demographic literature, in the presence of which the use of the ordinary least squares estimator biases the effect of the number of children.

While the econometric literature offers various approaches to account for endogeneity, one of these is the use of an instrumental variable. Using instrumental variable methods yields unbiased estimates even when fertility is or is not exogenous (Schultz, 2007). Different studies used different instrumental variables to generate exogenous variation in fertility. These include, for example, twin first birth (Chun and Oh, 2002; Kim, Engelhardt, Prskawetz, *et al*., 2009; Rosenzweig and Wolpin, 1980a), abortion legislation (Bloom, Canning, Fink, *et al*., 2009), contraceptive choice of couples (Kim and Aassve, 2006), sibling sex composition (Angrist and Evans, 1998; Cruces and Galiani, 2007), sibling sex composition and contraception unavailability (Aassve and Arpino, 2007) and sex of the first birth (Chun and Oh, 2002; Orbeta, 2005).

The present study uses two-step instrumental variable probit (ivprobit hereafter) method, which is one of the most common instrumental variable estimators (Wooldridge, 2009). The instrumental variable used consists of sex composition of the first two siblings born to a mother (same sex = 1; otherwise, 0). This instrument is chosen because sex composition of children is a random assignment and hence the sex of the siblings has no direct significant effect on maternal participation in economic activities while it impacts the number of children.

In this procedure, the first step equation uses ordinary least squares to predict the number of children as a function of the sex mix of the first and the second siblings, controlling for other covariates. Once the number of children is exogenously predicted in this way, the final equation which estimates the mother's work participation can be specified by inserting the predicted number of children as key independent variable of interest, also controlling for the same covariates in the first equation (refer to Appendix A for details).

3 Results

3.1 Characteristics of the study population

The tables below offer some descriptive statistics on the demographic and economic characteristics of sample households. **Table 1** and **Table 2** provide mean values and frequency respectively for sample households on selected demographic and economic variables across the rural-urban economies. As expected, **Table 1** shows that households in the urban sub-sample have higher average age at first marriage/child bearing and years of schooling compared to households in the rural sub-sample. **Table 1** also shows that household members including children for the urban sub-sample work for longer hours (perhaps due to urban children's older average ages) compared to their rural counter parts.

Table 1. Demographic and economic characteristics of sample households (means)

Variables	Mean values		
	Full sample	Urban sub-sample	Rural sub-sample
Age of household head (years)	45.8659	48.5623	41.9875
	(11.9563)	(12.3264)	(9.8497)
Number of children of the participant	4.8911	4.3952	5.5412
	(2.0945)	(2.1098)	(2.4102)
Average age of children of the participants (years)	13.7410	17.0014	11.0108
	(8.0197)	(8.9971)	(5.8945)
Age of the participant at first marriage (years)	15.7618	16.9961	14.5276
	(3.61805)	(3.85991)	(2.88352)
Age of the participant at bearing first child (years)	17.3415	18.7034	16.9856
	(3.0002)	(3.5142)	(2.4315)
Participant's years of schooling*	3.7981	5.9107	2.0098
	(4.8475)	(4.8910)	(2.7458)
Value of household assets (ETB)**	13904.0397	15152.3254	11001.7491
	(15047.4125)	(16049.1152)	(15012.3124)
Mean hours of work per day by household members (excluding parents)	3.02	4.00	2.1
	(0.21)	(0.34)	(0.21)
N	493	248	245

Note: Standard deviations are reported in parenthesis. Source: Survey data (2010 and 2013).
* if no formal education attended, years of schooling is recorded as 0.
** 1 USD=16.636 ETB on December 2010, and 19.1218 ETB on 31 December 2013.

The older average age and the fewer number of urban children is probably due to the relatively higher educational attainment of the urban women leading to the higher rates of contraceptive use (**Table 2**) and the mother's delayed age at first marriage/child bearing (**Table 1**).

Table 2 shows that, compared to the rural households, urban households have a higher proportion of female-headed households, a lower proportion of households who received loan, a lower rate of maternal work participation, a lower proportion of households with more than two children, and a higher proportion of households with members other than parents who work for the household. While the higher proportion of female-headed households and the lower rate of maternal work participation for urban relative to rural households are consistent with previous evidence, the lower rate of loan receipt by urban compared to rural households is unexpected since urban households are expected to have better access to the service given their proximity to credit facilities and the relatively capital-intensive nature of urban jobs.

Table 2. Demographic and economic characteristics of sample households (percentage)

Variables	Percent the event occurred		
	Full sample	Urban sub-sample	Rural sub-sample
Household head is female	19.7	29.3	10.1
Participant used contraceptives	51.5	74.4	28.6
Household received loan	43.5	36.2	51.5
Participant participated in productive work	47.7	38.8	56.5
Members other than parents participate in productive work	58.7	62.7	54.6
Members other than parents participate in non-productive work	65.2	67.3	63.1
First two siblings are the same sex	62.2	57.5	66.8
Households with more than two children	83.3	78.2	88.3
N	493	248	245

Source: Survey data (2010 and 2013).

3.2 Number of children and maternal employment status

Having described the characteristics of the study population, we now turn on to analyzing the effect of the number of children on the maternal productive work participation, using the two step instrumental variable estimator of the ivprobit model. Before that, however, we describe the maternal rate of work participation in relation to the number of children (**Table 3**).

Table 3. Number of children and percentage of participants who participated in productive work prior to the survey

No. of children	Full sample		Urban		Rural	
	N	% women working	N	% women working	N	% women working
2	82	34.3	53	31.2	29	42.6
3-4	148	46.8	86	55.1	62	37.9
5-6	149	42.1	63	21.8	86	55.1
7-8	76	60.7	32	36.2	44	77.5
9-10	30	58.2	14	27.3	16	86.2
≥11	8	100	---		8	100
Total	493	47.7	248	38.8	245	56.5

Source: Survey data (2010 and 2013).

Table 3 depicts that the number of children and the work participation rate of the mother during the specified period differ for the urban and the rural sub-samples. It shows that mothers who participated in productive work increase with increase in the number of children for the rural sub-sample, and, generally, for the full sample. The situation is less consistent for the urban sub-sample. However, the table clearly shows that the mother's work participation is relatively smaller for the urban sub-sample both on average and for each age group.

Table 4 and **Table 5** present results of the ivprobit regressions (and for the exogenous probit model for comparison). **Table 4** shows the amount of variance explained for maternal work participation given the number of children and control covariates. The p-value associated with the Wald χ^2 statistic (ivprobit) is significant at p = 0.022 for the full sample, suggesting that the model is well fit to the data overall, while this is not the case for the sub-samples. For the exogenous probit model, however, the p-values are significant for the sub-samples as well.

Table 4. Proportion of variance explained for maternal work by the number of children and other covariates

Model	Full sample		Urban sub-sample		Rural sub-sample	
	Wald χ^2 (LR χ^2 for OLS)	Prob > χ^2	Wald χ^2 (LR χ^2 for OLS)	Prob > χ^2	Wald χ^2 (LR χ^2 for OLS)	Prob > χ^2
Exogenous probit (%)	28.32	0.005	23.56	0.018	22.60	0.030
Ivprobit (%)	24.51	0.022	16.08	0.237	14.35	0.130
N	493		248		245	

Source: Survey data (2010 and 2013).

Table 5 shows parameter estimates for the ivprobit model (and exogenous probit model). It is worth noting, at this juncture, that this study does not intend to discuss coefficients from control variables (see Appendix B for coefficients from control covariates).

The table consists of three panels. Each panel compares results for the rural and urban locations. The first panel shows results for all households that differ only in their rural-urban location. The second and the third panels show results for households that differ by the age group of their children, in addition.

For the first panel, first, the ivprobit estimate has all positive coefficients for both the rural and urban locations, suggesting that an increase in the number of children is associated with an increase in the probability of the mother's work participation for the households, despite the lack of statistical significance for the ivprobit coefficients. While the lack of statistical significance for the ivprobit coefficients as opposed to those using the exogenous model is consistent also with several other previous research, the lack of difference in coefficient signs by rural-urban location is surprising because the difference in the employment structure between the rural and the urban economies is expected to respond to the effect of the number of children differently for the rural and the urban locations. However, this difference becomes fairly apparent once the lifecycle effect is considered by categorizing households according to age groups of their children (the last two panels of **Table 5**).

Table 5. Parameter estimates for maternal work participation by the number of children (with control variables)

Group of households	Model	Full sample		Urban sub-sample		Rural sub-sample	
		Coef.	p > z	Coef.	p > z	Coef.	p > z
All households	Exogenous probit	0.0918 (0.0321)	0.070	-0.2156 (0.0452)	0.061	0.1568 (0.0425)	0.004
	Ivprobit	0.1671 (0.2031)	0.418	0.0304 (0.1549)	0.315	0.8412 (0.1456)	0.113
	N	493		248		245	
Households with children of ages < 10 years	Exogenous probit	0.1903 (0.1102)	0.021	0.1843 (0.3201)	0.321	0.1497 (0.1222)	0.107
	Ivprobit	0.3349 (0.9742)	0.420	-0.0989 (1.7025)	0.498	0.7008 (0.5079)	0.092
	N	217		99		118	
Households with children of ages ≥ 10 years	Exogenous probit	0.9963 (0.1515)	0.088	-0.0845 (0.0852)	0.541	0.2111 (0.0981)	0.026
	Ivprobit	0.0711 (0.1845)	0.476	0.1252 (0.3602)	0.084	-0.9932 (6.961)	0.566
	N	276		149		127	

Note: Standard errors are reported in parenthesis. Source: Survey data (2010 and 2013).

The second panel of the table shows results for mothers with children of ages less than ten years. The third panel shows results for those mothers with children of ages ten years or older. For the urban sub-sample, the ivprobit coefficient is negative for the second panel, suggesting, as expected, that large number of young children decreases the probability of the mother's work participation, although it is not statistically significant. In the third panel, the ivprobit coefficient is positive and statistically significant at p = 0.084, suggesting that for urban mothers with more adult children, the negative effect of the number of children disappears and contributes positively. For the rural sub-sample, the ivprobit coefficient is positive and statistically significant for the second panel at p=0.092, suggesting that large number of young children increase the mother's probability of work participation. By contrast, for the third panel the ivprobit coefficient is negative, suggesting a

reversal in the positive effect of the number of children, although it is not statistically significant.

4 Discussion

Some key points emerge for discussion from the results section. The first is the relative importance of coefficients' magnitudes for estimates from exogenous probit and ivprobit models. That is, in some cases coefficients from exogenous estimates are larger than those from endogenous estimates, and in some other cases, the reverse is the case. The lack of consistency in coefficient size from the ivprobit estimator compared to the exogenous probit estimator in the present study, however, is in line with the available research evidence for several other countries. Most previous research shows larger coefficients from exogenous models exaggerating the effect compared to those from endogenous models (*e.g.*, Angrist and Evans, 1998 and references therein). However, there is also evidence documenting larger coefficients for estimates from endogenous rather than exogenous models. For example, Rosenzweig and Wolpin (1980a) note that instrumenting endogeneity increases the coefficients compared to the exogenous model. For Korea, Chun and Oh (2002) found larger coefficients using endogenous estimates compared to exogenous estimators when using households with at least one child, but smaller endogenous estimates when using households with at least two children.

Researchers (*e.g.*, Aassve and Arpino, 2007) attribute this inconsistency in exogenous and endogenous coefficients to the instrumental variable used. Whereas the use of sibling sex composition provides a natural experiment whereby households with same sex siblings are treatment groups and those with mixed sex siblings are control groups, a lack of consistency is expected since the two models estimate essentially different things owing to their reference to different samples (Aassve and Arpino, 2007). That is, the exogenous estimator coefficient represents the average effect of the number of children over the entire population in the sample, whereas the endogenous estimator coefficient represents the average effect of the number of children for those households whose first and second siblings have same sex. In such a case, results from the exogenous estimator may be due to variables other than the number of children such as biases from omitted variables, hence making causal inferences problematic.

The second point is regarding the heterogeneity in coefficient signs between the rural and the urban sub-samples. The negative ivprobit coefficient on the probability of maternal work participation effect of young children for the urban mother in the second panel (despite its being statistically insignificant) and the positive and statistically significant ivprobit coefficient in the third panel is consistent with most previous evidence, although most such research is based on rural-urban dummy instead of running separate analysis for rural and urban mothers (see *e.g.*, Angrist and Evans, 1998; Cáceres-Delpiano, 2008; Chun and Oh, 2002; Cruces and Galiani, 2007; Dupta and Dubey, 2003; Kim and Aassve, 2006; Orbeta, 2005; and references therein). This result is also consistent with previous lifecycle evidences. For example, Hotz and Miller (1988) found that children tended to have negative effects during their early ages but not during their adult ages, and that the intensity of time the mother spent tending her children markedly declined as children grew up. Similarly, Assaad and Zouari (2003) for urban Morocco found that the presence of school-age children significantly reduced the participation of women from all types of paid work.

The positive and statistically significant ivprobit coefficient for the rural sub-sample in the second panel, and the negative though statistically insignificant ivprobit coefficient in the third panel, nevertheless, are inconsistent with the theoretical prediction that holds that, other factors held constant, the mother's probability of work participant decreases with an increase in the number of young children and increases when children become more adult. However, consistent with this result, using data from the 2000 Ethiopian DHS and instrumenting the number of children with the husband's desire for children, Solomon and Kimmel (2009) found positive (but statistically insignificant) labor supply effect of children. In this connection, Angrist and Evans (1998:463) also cite a review that found that fertility either has no effect on maternal labor supply, or it has a positive effect when endogeneity is considered.

The question now is why is this so? In the present study, it is argued that, despite the lack of statistical significance for many of the ivprobit coefficients, the quantitative results' inconsistency with theory and most previous research for the rural households is rather due to the rural-urban difference in the employment structure and the effect of the household's lifecycle. Context-specific literature review and qualitative data seem to be revealing in this particular case.

First, the prevalence of household enterprises and traditional nature of farming in rural areas of poor economies including Ethiopia means that more rural women have to work longer compared to urban women (see *e.g.*, Arbache, Kolev and Filipiak, 2010). In Ethiopia, farm plots are fragmented, farming is done manually, and productivity is low. Households have to invest a lot of manual labor per unit area, and, as such, it would be likely for women to work in the farms especially when there are other children to look after very young children at home. In such circumstances, children may not be considered that much prohibitive to the mother's work given the nature of the economy and the mother's need to work for the family, despite the adverse health implications that this is likely to have on the young children.

There is ample evidence on this from maternal work and child care literature (*e.g.*, Samman, Presler-Marshall and Jones, 2016 and the references therein).

Second, work conditions are more flexible for rural economies than for urban economies (Kim and Aassve, 2006). Farms are not that much far from the house and the mother can flexibly use her time taking care of her child at home and working in the nearby farm plot. Even where farm plots are away from home, the mother can still manage to work. It is common, in Ethiopia for example, to see mothers doing the farming activities holding children on their backs or placing them in a tree shade beside the farm with another young child to look after the youngest child. This has also been well confirmed by information from qualitative observation and interview with some sample households.

A twenty-eight year old woman was holding her five-month daughter on her back when I met her cutting fodder from her maize farm. Her responses to questions I raised in the interview illustrate the argument above:

> My husband is sowing shimbra (a local name for chickpeas) in another farm. My daughter is sleeping now on my back, but she will begin crying eventually as she feels hot in the sun. Sometimes, she develops fever at night. I know this is bad for her, but I have to do this because there is no option. My younger sister, whom I brought to help with the household activities following my delivery is there working in the farm with my husband removing the weeds. I could have brought my other two children with me here to look after my daughter in the tree shade, but they are in the house watching for sito [some raw food stuffs such as grains, cereals, *etc*. put to dry in the sun before further processing] from bird pests.

Third, young children in many cases contribute to the family labor by taking care of the domestic chores. The domestic labor contribution of young children is also well documented in the literature (Aghajanian, 1979; Boserup, 1985; Caldwell and Caldwell, 1987; Cho, 2006). According to Cho (2006), children contribute to household economy by replacing the mother's activity at home. Boserup (1985) and Caldwell and Caldwell (1987) argue that in addition to their labor input, children in sub-Saharan Africa demand little child care, allowing the mother to spend her time on work. In the case of Ethiopia, Solomon and Kimmel (2009) also note that young children often contribute to domestic chores, which allows the mother to work away from home. They also note that Ethiopian mothers are unlikely to leave their jobs in the face of high unemployment and underemployment rates in the country. The quantitative data for the present study shows that members engaged in non-productive work for the household increased the work participation rate of the mother (see Appendix B). This result has also been well confirmed by qualitative observation and interview with children and parents. The qualitative data revealed that children were able to work for the household both as non-school children, pre-school children and school children. Some school-age children had their parents refused to send them to school, and so work for them; some children were too young for schooling, but can do some kind of work for their family (as in the young children's taking care of the sito in the house in the quotation above), and some others use their non-school hours for family work, such as the mornings, evenings, and the other half, non-school shift of the school day. In addition, many rural parents make their children be absent from school for several days, especially when there is a sign of untimely rain coming during periods of crop harvest.

Equally inconsistent with theory and most available evidence, despite the lack of statistical significance, is the more adult children's negative contribution to rural maternal work participation. In Ethiopia, it is often common to see older mothers working only a few hours a day or absenting themselves from farm work at all and staying home doing domestic chores compared to younger mothers. Results from the quantitative data show that, contrary to the positive maternal work participation effect of members engaged in non-productive work, members engaged in productive work decreased the mother's work participation. It can be argued that this is probably the result of work substitutability between the mother and other members of the household including children (especially of adult ones). This appears to have been also reinforced by other context-specific circumstances such as land tenure and the subsistence nature of farming coupled with poverty. In Ethiopia, land is owned by the state since 1974 and farmers have utilization rights of the land they have held. There were periodic land redistribution schemes during the Dergue government (1974–1991). The existing government had also redistributed land in 1995/96 and has certified the farmers as a security to their land utilization right. There has not been any redistribution carried out thereafter. As a result, male children were implicitly obliged to continue to work on parents' land, mainly as sharecroppers, even having been married and have own family. Their marriage also increases the household's labor force thus encouraging the mother to stay home doing the household chores. Even when married children might in some cases work on their own farm, or migrate to cities where they engage in non-farm activities, they might have to spend some days helping on their poor parents' farms, or hiring some daily labor for them. The rural to urban migration effect of restrictions in youth access to land is well documented in Bezu and Holden (2014). On the other hand, some better-off parents were able to hire daily labor by their own.

Evidence from the qualitative interview and observation is much more revealing. A forty-one year old woman having five live children out of six demonstrates this as follows:

> .... My eldest son has now passed 24 and has obtained two children. My second child is male and my third child is female. Both are married and have one child each. My fifth child [the fourth was dead] is male and is a grade 11 student living far away from us, and my youngest child is female and is a grade 8 student. .... Despite our land's being not big enough, we gave a small plot to our eldest son, but the kebele (a local equivalent for village administration) said he will not be given ownership certificate since no more land sub-division is allowed. As to our second son, we convinced him to farm with us and share the harvest. Our son and his wife and my husband as well took care of the farm work, and I stayed home preparing food for them and doing other activities. Meanwhile, our son left for ketema (a local equivalent for urban area) and now works there as gimbegna (a local equivalent for construction worker). Initially, his wife was still with us and was of great assistance working in the farms. Later on, however, he took her (along with her child) and I had to come back to farm work. This was difficult for me and my husband. We have grown these children, and are now getting old that we are not as strong to work in the farms as before. We also do not have money to pay for yeqen-serategna (a local equivalent for daily wage laborer) as our rich neighbors do. But, Egziabher yimesgen (a local equivalent for thanks to God), our eldest son agreed to work with us instead since the plot of land we gave him was too small, and so we merged the farm plots. Once again, my activity was confined to housework. Occasionally, especially during periods of peak farm activity, our son from ketema also sends us money to hire yeqen-serategna.

5 Conclusions

This paper used data from a household survey of rural and urban married women to test the theoretical prediction that labor market participation decreases for mothers with large number of young children and increases when children are adults.

Results show that, when all households are considered, children seem to have positive effects on the probability of the mother's work both for the full sample and also when the full sample is split into the rural and urban sub-samples. However, when household lifecycle differences are considered, coefficients are negative for households with large number of young children and positive for those households with more adult children for the urban sub-sample, roughly suggesting consistency with the lifecycle hypothesis and previous research evidence for other countries. Whereas for the rural sub-sample, coefficients signs are reversed, suggesting inconsistency with the theory.

While inconsistency of results among many previous studies has been acknowledged in the literature, the lack of statistical significance of ivprobit results in many of the cases in the present paper, suggests the difficulty of drawing a valid conclusion from the quantitative results alone in this particular case. At this point, at least two limitations of the present paper are noteworthy as potential causes for the weak statistical results. The first is potential problems in data quality including small sample size. The second is the attempt to capture lifecycle variations by categorizing women by their children's average age groups. Lifecycle effects are well studied using panel data which offer a unique opportunity for tracking the changes in the effect for a given household over a period of time. Cross-sectional data used in the present study do not have that capability and are thus inappropriate. The qualitative data and the reviews of context-relevant literature appear to have offered possible explanations for this inconsistent though, in many cases, not statistically significant result.

Conflict of Interest

No conflict of interest has been reported by the authors.

Ethics Approval

No ethics approval was required for this study.

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References

Aassve A and Arpino B (2007). Estimation of Causal Effects of Fertility on Economic Wellbeing: Evidence from Rural Vietnam. ISER Working Paper No. 24. University of Essex and University of Florence.

Adda J, Dustmann C and Stevens K (2011). The career costs of children. IZA Discussion paper No. 6201. Institute for the Study of Labor.

Aghajanian A (1979). Family economy and economic contribution of children in Iran: An overview. *Journal of South Asian and Middle Eastern Studies*, 35(1): 21-30.

Angrist JD and Evans W (1998). Children and their parents' labor supply: evidence from exogenous variation in family size. *The American Economic Review*, 88(3): 450-477.

Arbache JS, Kolev A and Filipiak E (2010). Why study gender disparities in Africa's labor market? In JS Arbache, A Kolev and E Filipiak (eds.). Gender Disparities in Africa's Labor Market. (pp. 357-377) Washington D. C.: The World Bank. https://doi.org/10.1596/978-0-8213-8066-6.

Assaad R and Zouari S (2003). Estimating the Impact of Marriage and Fertility on the Female Labor Force Participation when Decisions are Interrelated: Evidence from Urban Morocco. Topics in Middle Eastern and North African Economies, Vol. 5. Middle East Economic Association and Loyola University Chicago.

Becker GS (1960). An economic analysis of fertility. In: Universities-National Bureau (eds.). Demographic and Economic Change in Developed Countries. Columbia: Columbia University Press.

Bezu S and Holden S (2014). Are rural youth in Ethiopia abandoning agriculture? *World Development*, 64: 259-272. http://dx.doi.org/10.1016/j. worlddev.2014.06.013.

Bloom D, Canning D, Fink G, *et al*. (2009). Fertility, female labor force participation, and the demographic dividend. *Journal of Economic Growth*, 14(2): 79-101. https://doi.org/10.1007/s10887-009-9039-9.

Boserup E (1985). Economic and demographic interrelationships in Sub-Saharan Africa. *Population and Development Review*, 11(3): 383-397.

Browning M and Crossley T (2001). The life-cycle model of consumption and saving. *Journal of Economic Perspectives*, 15(3): 3-22. https://doi.org/10.1257/jep.15.3.3.

Cáceres-Delpiano J (2008). Keeping the Best for Last: Impact of Fertility on Mother's Employment: Evidence from developing countries. Working paper 08-68 No. 32. Universidad Carlos De Madrid.

Caldwell J and Caldwell P (1987). The cultural context of high fertility in Sub Saharan Africa. *Population and Development Review*, 13(3): 409-435.

Central Statistical Agency of Ethiopia and ORC Macro (2000). The Ethiopian Demographic Health Survey. Addis Ababa.

Central Statistical Agency of Ethiopia and ORC Macro (2005). The Ethiopian Demographic Health Survey. Addis Ababa.

Central Statistical Agency of Ethiopia and ORC Macro (2011). Ethiopia Demographic and Health Survey 2011: Preliminary report. Addis Ababa.

Chernichovsky D (1978). Personal savings and family size and composition: The unresolved issue. The Proceedings of the Conference of the International Union for the Scientific Study of Population: Economic and demographic change: issues for the 1980s. (pp. Vol 1: 345-360). Helsinki.

Cho, Y (2006). An Analysis of Women's Fertility and Labor Supply: Implications for Family Policies. Paper presented at International Conference on Declining Fertility in East and Southeast Asian Countries, December 14-15, Tokyo.

Chun H and Oh J (2002). An instrumental variable estimate of the effect of fertility on the labor force participation of married women. *Applied Economics Letters*, 9: 631-634. https://doi.org/10.1080/1350485011011785 0.

Cruces G and Galiani S (2007). Fertility and female labor supply in Latin America: New causal evidence. *Labour Economics*, 14(3): 565-573. https://doi.org/10.1016/j.labeco.2005.10.006.

Davies J (1988). Family size, household production, and life cycle saving. *Annales D'economie Et De Statistique*, 9: 141-165. https://doi. org/10.2307/20075685.

Davis P and Baulch B (2011). Parallel realities: Exploring poverty dynamics using mixed methods in rural Bangladesh. *The Journal of Development Studies*, 47(1): 118-142. https://doi.org/10.1080/00220388.2010.492860.

Desta CG (2013). Fertility and maternal hours of work in Ethiopia: A case study in the Amhara region. *African Population Studies*, 27(2): 89-104. https://doi.org/10.11564/0-0-431.

Dupta ND and Dubey A (2003). Poverty and Fertility: An Instrumental Variables Analysis on Indian Micro Data. Working paper series 11. Department of Economics, Aarhus School of Business.

Erosa A, Fuster L and Restuccia D (2016). A quantitative theory of the gender gap in wages. *European Economic Review*, 85: 165-187. http://dx.doi.org/10.1016/j.euroecorev.2015.12.014.

Fehr H and Ujhelyiova (2012). Fertility, female labor supply, and family policy. *German Economic Review*, 14(2): 138-165.

Francesconi M (2002). A joint dynamic model of fertility and work of married women. *Journal of Labor Economics*, 20(2): 336-380.

Hailemariam A, Alayu S and Teller C (2011). The National Population Policy (NPP) of Ethiopia: Achievements, challenges and lessons learned, 1993-2010. In C Teller and A Hailemariam (eds.). The Demographic Transition and Development in Africa: The Unique Case of Ethiopia. London, New York: Springer.https://doi.org/10.1007/978-90-481-8918-2.

Hotz VJ and Miller RA (1988). An empirical analysis of life cycle fertility and female labor supply. *Econometrica*, 56(1): 19-118.

Hulme D (2007). Integrating Quantitative and Qualitative Research for Country Case Studies of Development. GPRG-WPS No. 063. Global Poverty Research Group.

IMF (2006). The Federal Democratic Republic of Ethiopia: Poverty Reduction Strategy Paper - 2003/04 Annual Progress Report. Country report No. 06/27. Washington D. C.

Kanbur R and Shaffer P (2006). Epistemology, normative theory and poverty analysis: Implications for Q-squared in practice. *World Development*, 35(2): 183-196. https://doi.org/10.1016/j.worlddev.2005.10.016.

Kelley A and Schmidt R (2001). Economic and demographic change: A synthesis of models, findings and perspectives. In N Birdsall, AC Kelley and S Sinding (eds.). Population Matters. New York: Oxford University Press. https://doi.org/10.1093/0199244073.001.0001.

Kim J and Aassve A (2006). Fertility and its Consequence on Family Labor Supply. IZA Discussion paper series 2162. Vienna Institute of Demography & IZA Bonn & University of Essex.

Kim J, Engelhardt H, Prskawetz A, *et al.* (2009). Does fertility decrease household consumption? An analysis of poverty dynamics and fertility in Indonesia. *Demographic Research*, 20(26): 623-656.https://doi.org/10.4054/DemRes.2009.20.26

Lawson D, Hulme D and Muwonge J (2007). Methodological Issues Associated with Combining Quantitative and Qualitative Approaches to Understanding Poverty Dynamics: Evidence from Uganda. GPRG-WPS No. 077. Global Poverty Research Group.

McNicoll J (1984). Consequences of rapid population growth: An overview and assessment. *Population and Development Review*, 10(2): 177-233.

Ministry of Finance and Economic Development (2002). Ethiopia: Sustainable Development and Poverty Reduction Program. Addis Ababa. http://planipolis.iiep.unesco.org/sites/planipolis/files/ressources/ethiopia_prsp.pdf.

Ministry of Finance and Economic Development (2006). Ethiopia: Building on Progress: A Plan for Accelerated and Sustained Development to End Poverty (2005/06-2009/10). Volume I. Addis Ababa. https://extranet.who.int/nutrition/gina/sites/default/files/ETH%202005%20Plan%20for%20Accelerated%20and%20Sustained%20Development%20to%20End%20Poverty%20%28PASDEP%29.pdf.

Ministry of Finance and Economic Development (2010). Growth and Transformation Plan (2010/11 - 2014/15). Volume I. Addis Ababa. http://et.one.un.org/content/dam/unct/ethiopia/docs/GTP%20English%20Vol1%20(1).pdf.

Moffitt R (1984). Profiles of fertility, labor supply and wages of married women: A complete life-cycle model. *The Review of Economic Studies*, 51(2): 263-278. https://doi.org/10.2307/2297691.

Orbeta A (2005). Children and the labor force participation and earnings of parents in the Philippines. *Philippine Journal of Development*, 32(1): 19-52.

Ringheim K, Teller C and Sines E (2009). Ethiopia at a crossroads: Demography, gender, and development. Population Reference Bureau Policy brief. Washington D. C.

Rosenzweig MR and Wolpin KI (1980a). Testing the quantity-quality fertility model: The use of twins as a natural experiment. *Econometrica*, 48(1): 227-240.

Rosenzweig MR and Wolpin KI (1980b). Lifecycle labor supply and fertility: Causal inferences from household models. *Journal of Political Economy*, 88(2): 328-348.

Samman E, Presler-Marshall E and Jones N (2016). Women's work: Mothers, children and the global childcare crisis. ODI Report. London: Overseas Development Institute.

Schultz TP (2007). Fertility in Developing Countries. Discussion Paper 953. Economic Growth Center, Yale University.

Shaffer P (2012). Ten Years Of 'Q-Squared': Are Two Disciplines Better than One? Q-Squared Working Paper No. 57. Trent University.

Sheran M (2007). The career and family choices of women: A dynamic analysis of labor force participation, schooling, marriage, and fertility decisions. *Review of Economic Dynamics*, 10: 367-399.

Solomon B and Kimmel J (2009). Testing the Inverseness of Fertility and Labor Supply: The Case of Ethiopia. IZA Discussion paper No. 3949. Western Michigan University and IZA.

Transitional Government of Ethiopia (1993). The National Population Policy of Ethiopia. Office of the Prime Minister, Addis Ababa.

UN Population Division (2005). Population Challenges and Development Goals. Report No. ST/ESA/SER.A/248. Department of Economic and Social Affairs, New York.

UNDP (2001). UNDP Review of the Poverty Reduction Strategy Paper (PRSP). New York. http://www.lcgbangladesh.org/PovertyIssues/reports/UNDP%20PRSP%20Assistance.pdf.

UN Population Division (2017). *World Population Prospects: Key Findings and Advance Tables (The 2017 Revision)*. Report No. ESA/P/WP/248. Department of Economic and Social Affairs, New York.

UNFPA (2010). State of the World Population: Monitoring ICPD Goals.

Wooldridge JM (2009). Introductory Econometrics: A Modern Approach. Fourth Edition. Mason OH USA: South-Western SENGAGE Learning.

Appendix A

Model specification

First, the structural form for the probit regression model (Y_{1i}) can be given as:

$$Y_{1i} = \alpha_0 + x_{1i}\alpha_1 + Y_{2i}\beta + U_i \qquad (1)$$

where, Y_{1i} is the probability of mother's work participation for the ith household (1=If she works, 0=Otherwise)

α_1 is parameter coefficient of the vector of an exogenous variable, x_{1i}

β is parameter coefficient of the vector of the number of children, Y_{2i}

U_i is an error term assumed to be normally distributed with mean zero.

However, the literature tells us that the number of children (Y_{2i}) is endogenous. That is,

$$Cov(Y_{2i}, U_i) \neq 0 \qquad (2)$$

If the equation is estimated by OLS, the estimate will be biased. Therefore, Y_{2i} should be itself predicted first in a reduced form as a function of sibling sex composition, Z_i, and other covariates.

$$Y_{3i} = \delta_0 + x_{2i}\delta_2 + Z_i\gamma + e_i \qquad (3)$$

where, Y_{3i} is the predicted number of children for the ith household,

δ_2 is parameter coefficient of the vector of exogenous variables, x_{2i}, for the ith household,

γ is parameter coefficient of the vector of the instrumental variable, Z_i,

e_i is an error term associated to household i.

The instrumental variable, Z_i, is assumed to be uncorrelated with the error term, but partially correlated with the number of children. That is,

$$Cov(Z_i, U_i) = 0 \qquad (4) \text{ and,}$$

$$Cov(Z_i, Y_{2i}) \neq 0. \qquad (5)$$

The instrument is also assumed to be uncorrelated with other exogenous covariates. That is,

$$Cov(Z_i, X_{1i}) = 0. \qquad (6)$$

Because U_i is unobservable, $Cov(Z_i, U_i)$ is untestable, unlike $Cov(Z_i, Y_{2i})$ which can be readily tested using the data.

Once the number of children is exogenously predicted in (3), the final equation which estimates the mother's work participation can be specified by inserting the predicted number of children, Y_{3i}, in place of Y_{2i} as:

$$Y_{1i} = \alpha_0 + x_{3i}\alpha_3 + Y_{3i}\beta + \varepsilon_i \qquad (7)$$

where, Y_{1i} is defined as in (1) above.

α_3 is parameter coefficient of the vector of exogenous variables, x_{3i}

β is parameter coefficient of the estimated number of children, Y_{3i}

ε_i is an error term associated to household i.

The estimated maternal work participation, Y_{1i}, is now assumed to be unbiased.

Appendix B

Parameter estimates for maternal productive work participation by the number of children and control variables[1]

Variables	Exogenous probit						Ivprobit					
	Full sample		Urban sub-sample		Rural sub-sample		Full sample		Urban sub-sample		Rural sub-sample	
	Coef.	p>z	Coef.	p>z	Coef.	p>z	Coef.	p>z	Coef.	p>z	Coef.	p>z
Number of children	0.0918 (0.0321)	0.070	-0.2156 (0.0452)	0.061	0.1568 (0.0425)	0.004	0.1671 (0.2031)	0.418	0.0304 (0.1549)	0.315	0.8412 (0.1456)	0.113
Average age of children	0.0982 (0.0241)	0.113	0.0352 (0.0098)	0.421	0.0934 (0.0401)	0.101	0.0745 (0.0127)	0.211	0.0112 (0.0198)	0.107	-0.0785 (0.0345)	0.113
Sex of household head	0.1845 (0.1987)	0.451	0.5145 (0.1845)	0.054	0.1305 (0.3512)	0.625	0.1562 (0.2189)	0.408	0.3190 (0.3163)	0.301	0.1052 (0.4009)	0.651
Age of household head	-0.0107 (0.0074)	0.201	0.0212 (0.0151)	0.213	-0.826 (0.0321)	0.071	-0.0564 (0.0170)	0.215	-0.1151 (0.0338)	0.412	-0.0777 (0.0307)	0.137
Participant's age at first marriage	0.1342 (0.0361)	0.105	0.2221 (0.0212)	0.265	0.0997 (0.0121)	0.415	0.1121 (0.0415)	0.511	0.2241 (0.0501)	0.671	0.1057 (0.0512)	0.253
Years of schooling of the participant	0.0095 (0.0555)	0.524	0.0886 (0.0346)	0.111	-0.0213 (0.0358)	0.671	0.0652 (0.0398)	0.214	0.0757 (0.0322)	0.201	0.0152 (0.0333)	0.221
Contraceptive use (Yes=1, Otherwise=0)	0.1412 (0.1042)	0.346	0.4141 (0.2112)	0.208	0.1111 (0.5242)	0.741	0.1127 (0.2020)	0.581	0.4025 (0.4240)	0.289	0.0120 (0.4151)	0.888
Loan receipt (Yes=1, Otherwise=0)	0.1919 (0.1701)	0.230	0.7194 (0.1939)	0.031	0.1145 (0.1212)	0.366	0.2191 (0.0881)	0.444	0.4171 (0.2235)	0.111	0.1515 (0.2320)	0.424
Members other than parents engaged in non-productive work	0.3323 (0.1545)	0.012	0.6652 (0.2145)	0.051	0.2002 (0.2525)	0.216	0.4097 (0.1818)	0.143	0.6076 (0.3041)	0.068	0.2451 (0.4041)	0.019
Members other than parents engaged in productive work	-0.0989 (0.1801)	0.601	0.4909 (0.2554)	0.134	-0.5021 (0.2444)	0.129	-0.0666 (0.1965)	0.184	0.4098 (0.2828)	0.113	-0.5142 (0.2099)	0.101
Mean hours of daily work by household members (excluding parents)	-0.1452 (0.1745)	0.521	0.3541 (0.2513)	0.125	-0.0819 (0.2242)	0.210	-0.2535 (0.2004)	0.241	0.2514 (0.2156)	0.121	-0.6852 (0.2002)	0.127
Constant	0.0194 (0.2524)	0.699	-0.6523 (0.5124)	0.214	0.5262 (0.1426)	0.115	0.0098 (0.4251)	0.721	-0.8898 (0.9859)	0.235	0.1104 (9445)	0.546

[1] Covariates controlled. Because of the endogeneity of fertility to economic indicators, employing the ordinary least squares (OLS) estimator in which maternal labor market participation is regressed on the observed number of children becomes misleading. To acknowledge this problem, the two stage instrumental variable was used. In the first stage, the observed number of children were regressed on sex composition of the first two siblings borne to a woman (1=same sex; 0, Otherwise), plus other covariates controlled in the model. In the second stage, maternal labor supply was regressed on the predicted number of children (predicted in the first stage) as the key independent variable of interest, plus the same variables control in the first stage. The idea is that sibling sex mix (the instrumental variable) determines the number of children exogenously (*i.e.*, it has direct effect on the number of children, but no effect on maternal labor supply). For comparison purpose, both exogenous (exogenous probit) and endogenous models (ivprobit) were estimated. Standard errors are reported in parentheses.