

Rural-urban differential in fertility and maternal work participation: A study in Northwestern Ethiopia

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Abstract

Background: The inverse relationship between urbanization and fertility is well known in the development literature. However, whether this location difference also translates into rural-urban maternal economic outcomes differential is not well understood. Majority of past research which found inverse relationship between number of young children and maternal economic outcome failed to analyze rural and urban areas separately.

Data and methods: This paper used data from a household survey of rural and urban married women to analyze if the causal effect of fertility on maternal work participation differs between rural and urban areas.

Findings: Results show that when rural-urban location differences are considered, coefficients are negative for urban households with large number of young children and positive for those households with more adult children; whereas these coefficient signs reversed for rural households.

Conclusion: Results from the quantitative data combined with qualitative narratives suggest that large numbers of young children may not prohibit rural mothers from working.

Keywords: Maternal work participation; Amhara region of Ethiopia; lifecycle fertility; urbanization and fertility; urbanization and maternal work participation.

Introduction

The adverse consequence of rapid population growth both on national economic development and household level well-being has been widely acknowledged by the economic demographic literature. Apart from influencing academic discussions on the topic, the literature has also shaped developing countries' national population policies and programs objectives and strategies. No exception, the Ethiopian population policy and the different national development plans are also based on the premise that the rapid population growth has adverse consequence on Ethiopian development efforts (IMF, 2006; Ministry of Finance and Economic Development, 2002; 2006; 2010; Transitional Government of Ethiopia, 1993; UNDP, 2001; UN Population Division, 2005). The consecutive five-year national development plans identify, among other things, ensuring 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 (UN Population Division, 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). Fertility is substantially lower for urban women compared to rural women. For example, for 2000, 2005 and 2011, TFR was 3.3, 2.4 and 2.6 for urban women; and 6.4, 6.0 and 5.5 for rural women (Central Statistical Agency of Ethiopia and ORC Macro, 2000, 2005, 2011). The rural-urban differential in fertility rate can be expected, but what would not be expected is the large magnitude of the difference given the low level of the urban population (about 80% of the population is employed by agriculture which is still subsistent), and lack of urban job opportunities which would discourage childbearing.

In terms of maternal work participation, the percentage of women working in productive activities is low. For example, the 2005 Ethiopian

DHS (Central Statistical Agency of Ethiopia and ORC Macro, 2005) shows female participation rate to be 39.6% and 26.6% respectively for women in the urban and rural sub-samples by the time of the survey. The preponderance of urban women compared to rural women participating in the labor market is expected, but this difference is not comparable to the difference in their TFRs. That is, for various reasons including maternal employment and the role of other factors such as differential contraceptive use patterns, marriage rates and age at first marriage of rural and urban women, urban fertility for 2005 (the only survey which asked employment questions) was 60% lower than rural fertility, but labor market participation of urban women was only about 33% higher than the figure for rural women. Apart from its implication for the ongoing theoretical discussion regarding maternal labor market participation effect of fertility, this low maternal labor supply amid falling fertility rate may have important implication to the achievement of the much hoped-for growth and transformation plans (GTPs), which, for example, had targeted to hit a TFR of 4.0 through accelerated structural change and urbanization.

The question of interest to the present study, therefore, is whether and the extent to which the widely acknowledged rural-urban structural difference which is assumed to have resulted in this high rural-urban fertility variation also translates into a corresponding rural-urban differential in maternal economic outcomes. Available evidence is very limited, in the sense that there is no research that analyzed data for rural and urban locations separately (existing research simply used rural-urban location dummy). For Ethiopia, a study of the relationship between fertility and maternal labor market participation even using the rural-urban location as a dummy variable is extremely limited. In this case, the first published work known to the present author is by Solomon and Kimmel (2009). As is noted above, the use of location dummy provides only overall mean difference in terms of the dependent variable (Chin, 1995). On the other hand, Desta (2017) attempted to analyze the data separately for rural and urban women, but much emphasis was given to econometric issues in discussing the results, with marginal attention to the rural-urban differential.

Therefore, the present study uses a household sample survey data from rural and urban married women with at least two live children to examine the extent to which fertility differs among samples of urban and rural women in Ethiopia, and whether and the extent to which fertility influences work participation differently for urban and rural women. In order to see the effect of sibling sex mix on the

number of children as an instrumental variable, a woman should have at least two children. By doing so, the paper compares rural and urban women separately in terms of their fertility levels and work participation outcomes.

Literature review and theoretical framework

Previous research assumed fertility to vary merely by whether or not the mother was participating in paid work, without considering separate analysis for urban and rural contexts (Chin, 1995) and also without distinguishing informal activities from formal labor markets. Standard economic 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 (see e.g. Becker, 1960, 1965). In these theories, 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, 1965; 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, 1965; Hotz and Miller, 1988; Rosenzweig and Wolpin, 1980b). However, apart from failure to distinguish informal employment (e.g. self employment) from formal employment (wage and salary), existing research is constrained by two major limitations, namely, lack of analysis of fertility and maternal work participation separately for rural and urban households, and lack of dynamic analytical models.

Regarding the first issue, the inverse relationship between urbanization and fertility is well known in the socioeconomic and demographic literature since socioeconomic development and modernization creates more opportunities for women outside the domestic sphere. According to White et al (2005; 2008), in the literature, various economic, sociological, psychological and demographic explanations are offered to explain the rural-urban fertility differential, including (1) earnings forgone in raising children, (2) the employment-childrearing dilemma and resources required to raise children including urban housing, (3) ideational (beliefs and attitudes) change regarding the number and value of children and work outside the home, and (4) access to health services and modern contraceptives which influence fertility directly and/or indirectly. Whether one privileges sociological (employment-childrearing

problem and direct childrearing costs) determined by the complex relationship of social and economic institutions in a given society, household economics (opportunity cost of childrearing) determined by economically rational choice, psychological (social networks and the diffusion of ideas), or demographic (mortality decline and the birth control) explanations, there is ample evidence to suggest that all these mechanisms operate better in urban areas. For developing countries including sub-Saharan Africa, this is due to better implementation of family planning and women's sexual reproductive health rights in urban areas often inherited from its successful implementation in Europe and women's higher social and economic status in urban compared to rural areas (Banounin et al., 2018).

This rural-urban fertility differential has long been demonstrated for developed countries (Chin, 1995; Guo et al., 2012 and the references cited therein; Lindstorm and Woubalem, 2003; National Research Council, 2003; Sathar and Kazi, 1989; White et al., 2005;). At macro-level, there is also an inverse relationship between fertility and urbanization (defined in terms of socioeconomic development and changes in social norms and gender roles) for many developing countries, with fertility declining as development progresses (Banounin et al., 2018; Bongaarts and Watkins 1996; Bryant, 2007; Lerch, 2017; Lindstorm and Woubalem, 2003; Mulenga et al., 2018; Sathar and Kazi, 1989; Tadesse and Headey, 2011 and the references cited therein; White et al., 2005). For example, empirical evidence shows the urban fertility in Sub-Saharan Africa to be, on average, almost 30 percent lower than the rural fertility (Dudley and Pillet 1998; Fanaye Tadesse and Headey, 2011). However, there are also studies which did not find low fertility among urban compared to rural households in sub-Saharan Africa (see. e.g. Beguy, 2009; White, 2005 and the references cited therein). This suggests that existing knowledge is not conclusive, and relatively little is known for individual developing countries, especially for sub-Saharan Africa (Beguy, 2009 and the references cited therein; Lerch, 2017; Sathar and Kazi, 1989; White et al., 2005; White et al., 2008). Most importantly, most past research used a rural-urban location dummy rather than performing separate analysis for each, which shows difference in terms of the dependent variable, but does not allow comprehensive comparison between rural and urban areas (Chin, 1995). Even as such, this offers only part of the story - rural-urban fertility differential, not rural-urban maternal employment differential.

However, it should be expected, at least theoretically, that structural difference between rural and urban areas influences the wellbeing effects of

fertility to differ extensively between urban and rural households. For example, urban areas have more wage work compared to rural areas, and the nature of the urban economy is such that it is not compatible with childrearing, suggesting a fertility reducing effect. Partly for this reason, governments are often advised to accelerate urbanization and enhance the capacity of cities.

Regarding the lack of dynamic analytic models, the preponderance of static nature of models in past research is 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 and 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 household level is empirically little explored (see e.g., Browning and Crossley, 2001; Davies, 1988; Kelley and Schmidt, 2001).

As is argued, structural difference between rural and urban areas is expected to influence the wellbeing effects of fertility to differ extensively between urban and rural households. Despite this, and, by merely modeling fertility as a function of static household choice relative to other goods and

budget and time constraint faced by the household, past research failed to highlight whether and the extent to which the widely acknowledged rural-urban structural difference which has presumably resulted in high rural-urban fertility variation also translates into rural-urban differential in maternal socioeconomic outcomes. The present paper addresses this question.

Data and methods

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. From a theoretical point of view, the time lapse may have an important effect on the outcome variables. However, given the specific context of the study region where there was no any observed demographic, socioeconomic, and institutional changes in policy and practice, the author assumed a possible effect of the time lapse to be minimal. 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, 2011; Hulme, 2007;

Kanbur and Shaffer, 2007; Lawson, Hulme and Muwonge, 2007; Shaffer, 2012).

This article, therefore, 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. Six interviews and observations were made for rural women (two with women, three with children and one with a man). An observation was made as a member or members of a household engaged in an activity for the given 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.

Measurements

The dependent variable for the present study is the mother's participation in economic activities. Most previous research defined maternal work participation as a woman's participation in that component of work which is paid (in the paid labor market), as narrowly defined in the national system of accounts (SNA). Scholars have acknowledged the problem of this narrow and restrictive definition of work, and as a consequence, an extended definition has been introduced in 1993 as an additional component (see. e. g. Antonopoulos and Hirway, 2010; Blackden & Wodon, 2006; Colman, 1998; Francavilla et al, 2011). The concept of maternal work in the present study is thus used in line with the extended definition to include paid or unpaid; employed or self-employed; formal or informal. The key independent variable of interest is the number of children (see discussion on the next section on how this variable was measured). In addition, a number of other demographic and socio-economic variables were also used as control variables, including average age of children (in years), sex and age (in years) of the household head, women's age at first marriage (in years), women's years of schooling, modern contraceptive use (yes=1; otherwise, 0), loan receipt (yes=1; otherwise, 0), value of household assets in terms of Ethiopian Birr - ETB (estimated by adding money value of all household assets in the then current market price), number of members in the household other than parents engaged in productive

or non-productive work, and mean daily hours of their work. The choice of these variables is in line with most previous studies on the similar topic.

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 development literature in general and the economic demographic literature in particular, in the presence of which the use of the ordinary least squares estimator biases the effect of the number of children. While the economic demographic literature offers various approaches to account for endogeneity, one of these is the use of an instrumental variable. Several studies used different instrumental variables as a solution to this problem. 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 (see Appendix B). For both stages, data were analyzed first using the full sample and then separately for the urban and the rural sub-samples. In doing so, women were categorized by their children's average age groups to capture lifecycle variations in the effects.

Results

Characteristics of the sample population

The tables below offer some descriptive statistics on the demographic and economic characteristics of sample households. Table 1 and Table 2 provide frequency and mean values respectively for sample households on selected demographic and socioeconomic variables across the rural-urban economies. Table 1 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 1. 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 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 have 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).

As expected, Table 2 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 2 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. 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 1) and the mother's delayed age at first marriage/child bearing (Table 2).

Table 2. 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 (11.9563)	48.5623 (12.3264)	41.9875 (9.8497)
Average age of participant's children (years)	13.7410 (8.0197)	17.0014 (8.9971)	11.0108 (5.8945)
Participant's age at first marriage (years)	15.7618 (3.61805)	16.9961 (3.85991)	14.5276 (2.88352)
Participant's age at bearing first child (years)	17.3415 (3.0002)	18.7034 (3.5142)	16.9856 (2.4315)
Participant's years of schooling (0 if no schooling)	3.7981 (4.8475)	5.9107 (4.8910)	2.0098 (2.7458)
Value of household assets (ETB)*	13904.0397 (15047.4125)	15152.3254 (16049.1152)	11001.75 (15012.3)
Mean hours of work per day by household members (excluding parents)	3.02 (0.21)	4.00 (0.34)	2.1 (0.21)
N	493	248	245

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

* 1 USD = 16.636 ETB on 31 December 2010, and 19.1218 ETB on 31 December 2013.

Number of children and maternal employment status

Tables 3 and 4 below describe the rural-urban differential in the number of children and maternal rate of work participation in relation to the number

of children. As expected, Table 3 shows a statistically significant difference in the number of children for women between urban and rural sub-samples. This result is in line with the available empirical evidence.

Table 3. Rural-urban variation in the number of children (mean difference)

Full sample (N=493)	Urban sub-sample (N=248)	Rural sub-sample (N=245)	Rural-urban differential*	Sig. (2-tailed) for differential
4.8992 (2.321)	4.4597 (2.1276)	5.3387 (2.4291)	0.8790 (.2899)	0.003

Note: Standard deviations are reported in parenthesis (standard error differences are reported for the rural-urban differential). Source: Survey data (2010 and 2013).

Table 4 depicts that 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 an 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. Number of children and percentage of women 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).

Having described the characteristics of the study population and the rural-urban variation in the number of children and maternal work participation, we now turn on to analyzing the effect of the number of children on the maternal work participation, using the two step instrumental variable estimator of the ivprobit model. Table 5 shows parameter estimates for the ivprobit model (and exogenous probit model). Note that this study does not intend to discuss coefficients from control variables (see the Appendix 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).

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.

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

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	.0918 (.0321)	0.070	-.2156 (.0452)	0.061	.1568 (.0425)	0.004
	ivprobit	.1671 (.2031)	0.418	.0304 (.1549)	0.315	.8412 (.1456)	0.113
	N	493		248		245	

Households with children of ages < 10 years	Exogenous	.1903	0.021	.1843	0.321	.1497	0.107
	probit	(.1102)		(.3201)		(.1222)	
	ivprobit	.3349	0.420	-.0989	0.498	.7008	0.092
		(.9742)		(1.7025)		(.5079)	
	N	217		99		118	
Households with children of ages >= 10 years	Exogenous	.9963	0.088	-.0845	0.541	.2111	0.026
	probit	(.1515)		(.0852)		(.0981)	
	ivprobit	.0711	0.476	.1252	0.084	-.9932	0.566
		(.1845)		(.3602)		(6.961)	
	N	276		149		127	

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

Discussion

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 participation 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) maternal 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. In the context of fertility and poverty, Mberu et al.'s (2016) review of past research also shows positive relationship

between fertility and poverty for many developing countries and negative relationships for some very poor countries.

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 too 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 illustrates the argument above:

My husband is sowing shimbra [a local name for chickpeas] in another farm plot. 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, which is 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 housework for the household increased the work participation rate of the mother (see Appendix A). 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 detain their children 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 housework, 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 having own family. Their marriage increases the household's labor force thus further 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 (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.

If the situation for women in the rural sub-sample can be explained in this way, what can explain the case for women in the urban sub-sample (mothers of children of ages less than 10 years) whose coefficient is negative but not statistically significant? The forgoing discussion regarding the theoretically inconsistent results of maternal work participation effect of children in rural areas contrasted the traditional and subsistent nature of the rural economy against the urban modern economy, the latter often characterized to be so by the theoretical literature. However, in practice, much of the Ethiopian urban labor market is informal, and so can be compared (rather than contrasted) to its rural counterpart. The coefficient is negative because (1) young children can deter some of the women who have to work for wage (public, private), and (2) scarce urban job opportunities and low wages coupled with the high rural-urban migration may confine women to childcare and domestic chores. While informal activity is often mentioned as the solution because of the alleged ease with entry (e.g., low start-up capital,

no license requirements, low skills, flexible working premises, and so forth) (Desta, 2018), starting own business may be practically difficult for very poor urban women who do not have the startup capital even as it is low. The low proportion of urban women working in the data may help explain this. On the other hand, the coefficient is statistically insignificant perhaps because of the informal, child-friendly nature of most urban jobs, which may not necessitate hiring of childcare givers. Even when a woman considers to hire childcare giver, this is not easy since it brings her in stiff competition with the informal employers in other activities, such as construction, which rely heavily on unskilled labor (Desta, 2018). The wage offered by such employers often outbids the price poor urban households can offer.

Conclusion

The rural-urban fertility differential is widely acknowledged in the socioeconomic and demographic literature. However, very little is known whether this fertility differential also translates to a corresponding rural-urban differential in maternal work participation. This paper used data from a household sample survey of women with at least two live children to examine the extent to which fertility differs among samples of urban and rural women in Ethiopian, and whether and the extent to which fertility influences work participation differently for urban and rural women.

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

The lack of statistical significance of some of the results in the present paper, suggests the difficulty of drawing a valid conclusion from the quantitative results alone in this particular case, in which analysis is rather based on a small sample. However, results from the quantitative data combined with qualitative narratives suggest that large numbers of young children may not prohibit rural mothers from working, but they are also not that prohibitive of urban mothers work participation. The qualitative data and the reviews of context-relevant literature appear to have offered possible explanations for these results, which, from the quantitative literature point of view, seem inconsistent.

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APPENDICES

Appendix A

Parameter estimates for maternal work participation by the number of children and control variables

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	.0918	0.070	-.2156	0.061	.1568	0.004	.1671	0.418	.0304		.8412	0.113
	(.0321)		(.0452)		(.0425)		(.2031)		(.1549)	0.315	(.1456)	
Average age of children	.0982	0.113	.0352	0.421	.0934	0.101	.0745	0.211	.0112	0.107	-.0785	0.113
	(.0241)		(.0098)		(.0401)		(.0127)		(.0198)		(.0345)	
Sex of household head	.1845	0.451	.5145	0.054	.1305	0.625	.1562	0.408	.3190	0.301	.1052	0.651
	(.1987)		(.1845)		(.3512)		(.2189)		(.3163)		(.4009)	
Age of household head	-.0107	0.201	.0212	0.213	-.826	0.071	-.0564	0.215	-.1151	0.412	-.0777	0.137
	(.0074)		(.0151)		(.0321)		(.0170)		(.0338)		(.0307)	
Female spouse's age at first marriage	.1342	0.105	.2221	0.265	.0997	0.415	.1121	0.511	.2241	0.671	.1057	0.253
	(.0361)		(.0212)		(.0121)		(.0415)		(.0501)		(.0512)	
Female spouse's years of schooling	.0095	0.524	.0886	0.111	-.0213	0.671	.0652	0.214	.0757	0.201	.0152	0.221
	(.0555)		(.0346)		(.0358)		(.0398)		(.0322)		(.0333)	
Contraceptive use (Yes=1, Otherwise=0)	.1412	0.346	.4141	0.208	.1111	0.741	.1127	0.581	.4025	0.289	.0120	0.888
	(.1042)		(.2112)		(.5242)		(.2020)		(.4240)		(.4151)	
Loan receipt (Yes=1, Otherwise=0)	.1919	0.230	.7194	0.031	.1145	0.366	.2191	0.444	.4171	0.111	.1515	0.424
	(.1701)		(.1939)		(.1212)		(.0881)		(.2235)		(.2320)	
Birr value of household assets (log transformed)	.0215	0.352	.10423	0.086	-.2104	0.097	.0197	0.412	.1124	0.075	-.0982	0.381
	(.318)		(.0845)		(.0398)		(.052)		(.0352)		(.0804)	
Members other than parents engaged in non-productive work	.3323	0.012	.6652	0.051	.2002	0.216	.4097	0.143	.6076	0.068	.2451	0.019
	(.1545)		(.2145)		(.2525)		(.1818)		(.3041)		(.4041)	
Members other than parents engaged in productive work	-.0989	0.601	.4909	0.134	-.5021	0.129	-.0666	0.184	.4098	0.113	-.5142	0.101
	(.1801)		(.2554)		(.2444)		(.1965)		(.2828)		(.2099)	
Mean hours of work by household members (excluding parents)	-.1452	0.521	.3541	0.125	-.0819	0.210	-.2535	0.241	.2514	0.121	-.6852	0.127
	(.1745)		(.2513)		(.2242)		(.2004)		(.2156)		(.2002)	
Constant	.0194	0.699	-.6523	0.214	.5262	0.115	.0098	0.721	-.8898	0.235	.1104	0.546
	(.2524)		(.5124)		(.1426)		(.4251)		(.9859)		(.9445)	

Standard errors are reported in parentheses.

Appendix B

The present study uses two-step instrumental variable probit (ivprobit hereafter) method, which is one of the most common instrumental variable estimators (Wooldridge, 2009). 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 two first-born siblings, controlling for other covariates.

The instrumental variable used consists of sex composition of the first two siblings born to a mother (same sex=1; otherwise, 0).

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

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

where, Y_{1i} is the probability of mother's work participation for the i^{th} 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,

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

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.

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

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

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

$$Cov(Z_i, U_i) = 0 \quad (4)$$

and,

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

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

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

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:

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

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.