Journal of Population and Social Studies, Volume 22 Number 2 July 2014: 202 - 218
DOI: 10.14456/jpss.2014.12

Fertility and Household Consumption Expenditure in Ethiopia: A Study in the Amhara Region

Chalachew Getahun Desta[1]

Abstract

Eradication of extreme poverty and hunger has been identified as the number one priority for the Millennium Development Goals (MDGs). Theoretical work on the effect of the number of children on household well-being suggests a negative effect, since the resources available are divided among more household members. The vast majority of empirical studies find results consistent with this expectation, but some fail to link high fertility to lower well-being of the household. The purpose of this paper is to document the effect of the number of children on the consumption expenditure of Ethiopian households. The study uses data from a household sample survey of rural and urban married women and employs a Two-Stage Least Squares (2SLS) model. Analysis is made separately for per capita consumption and equivalized consumption. Results suggest that while the relationship is negative and statistically significant for all expenditure scenarios for the rural sub-sample and for the full sample, this is not the case for the urban sub-sample. Our results confirm the theoretical prediction that the effect of a large number of children on consumption expenditure of households is negative for rural households, whereas results for urban households are not as clear.

Keywords

Exogeneity/endogeneity; consumption expenditure; equivalized expenditure; per capita expenditure; observed fertility; predicted fertility

Introduction

The Ethiopian national population policy was launched in 1993 with the overall aim of ensuring balanced population and economic growth (Transitional Government of Ethiopia (TGE), 1993). Despite its promulgation, policy implementation was weak, partly due to insufficient political commitment and weak capacity. This remained the case until 2005, when both fertility rates and population were given increased attention, as evidenced by Ethiopia's consecutive national development policies and programs (United Nations Development Program (UNDP), 2001; United Nations Population Division, 2005; International Monetary Fund (IMF), 2006; Ministry of Finance and Economic Development (MoFED), 2002, 2006, 2010; Ministry of Work and Urban Development (MWUD), 2007). The national development plans during this period identify, among other things, poverty reduction to be critical for achieving planned development. One major strategy identified in the plan is ensuring balanced population and economic growth, for

[1] Center for Population Studies, Addis Ababa University, Ethiopia.
E-mail: chalget@gmail.com; chalzert@ymail.com

example through reducing fertility. Eradication of poverty and hunger has also been identified as the number one priority of the Millennium Development Goals (MDGs).

While fertility rates in Ethiopia have been among the highest in developing countries, there appears to be a substantial decline in recent years. Modern contraceptive use has recently risen from 11% in 2000 and 15% in 2005 to 29% in 2010. Correspondingly, the total fertility rate is declining substantially, although it is still high: from 5.9 in 2000 and 5.4 in 2005 to 4.8 in 2010 (Central Statistical Authority of Ethiopia (CSA) & ORC Macro, 2001; CSA & ORC Macro, 2006; CSA, MEASURE DHS & ICF Macro, 2011). The average annual rate of population growth has also dropped from 2.9% during the 1984 – 1994 intercensal period to 2.6% during the 1994 – 2007 intercensal period (United Nations Population Fund (UNFPA), 2010; Hailemariam, Alayu & Teller, 2011).

However, with fertility declining much more slowly than mortality, the country is still in the early stages of the demographic transition (Ringheim, Teller & Sines, 2009; Gebreselassie, 2011). Although the urban population is growing at a rate of 3.5%, which is significantly higher than the overall rate of total population growth, 83% of the population still resides in rural areas (UNFPA, 2010). The mode of farming is primitive and labor intensive by any standard (Aassve et al., 2005). As a result, child labor is prevalent and remains critically important, as Ethiopia remains a heavily traditional agricultural economy (Admassie, 2002). Focusing more narrowly on issues pertinent to the present study, poverty is widespread in the country. Malnutrition still remains chronic despite improvements over time (MoFED, 2006). For example, nearly two-thirds of children measured at 80% or less of their expected weight for age (TGE, 1993). The most recent Ethiopian DHS shows that overall 44.4% of children are malnourished as measured by height for age (46.2% for rural and 31.5% for urban) (CSA, MEASURE DHS & ICF Macro, 2011). If this high fertility and high poverty incidence continue, efforts being made to achieve the planned growth and transformation would be less likely to succeed.

Of interest given the current situation regarding fertility and poverty is the question of whether (and the extent to which) fertility influences the economic well-being of Ethiopian households. The effect of the reduced fertility trend described above is not as clear . Theoretical work suggests that household size, and specifically the number of children, has a negative effect on the household's food and essential non-food consumption, since the resources available to the household are divided among many household members. The vast majority of empirical studies find results consistent with this theoretical prediction, but there are some studies from developing countries which fail to replicate it (Schoumaker & Tabutin,1999).

The objective of the paper is to investigate the effect of the number of children on the consumption expenditure of households. It provides additional evidence on this effect for households in Ethiopia, using data from a household survey of rural and urban married women with at least two living children.

Data and methods

The data used to examine this question were collected from a survey conducted in a sample of rural and urban households. Urban households were selected from four *kebeles* (the smallest unit in the administrative structure of Ethiopia) out of the total of nine *kebeles* in Bahir Dar City, the Amhara Regional State capital. Sampling was first stratified by the physical qualities of housing units in order to obtain socio-economically representative data. We assume that selecting households from neighborhoods with contrasting housing conditions allows us to capture socio-economically diverse households. Consequently we selected two *kebeles* with informal, sub-standard housing conditions and two *kebeles* with formal, standard housing conditions. Sample households were selected randomly from each *kebele*. The rural sample households were selected from two rural districts located near but not physically contiguous to the city. Households were randomly selected from one *kebele* drawn from each of the two districts. As rural households relative to urban households are socio-economically less diverse, we did not feel the need to further stratify the rural sample. Note that households with more than one couple in the household were not included in the survey.

In the interview,[2] married mothers with at least two children living with the household were asked to provide information on a wide range of demographic and socio-economic factors. The number of households selected for the rural and urban sample was equal (140 each). However, only 131 interviews were completed for the urban households and 127 questionnaires for the rural households. For the urban sample, four cases had missing values on important variables and were thus discarded. This resulted in an equal sample size for the urban and the rural sub-samples (127 each), allowing for easy comparison of the results. The questionnaire was filled in by the enumerators in a one-on-one interview with each household.

Data were analyzed first using the full sample and then separately for the urban and rural sub-samples. The reason for the separate analysis was the need to see if the widely acknowledged rural-urban difference in fertility also holds for the economic well-being effect of the number of children.

Variables

The dependent variable is the reported consumption expenditure of the household, measured separately as per capita and equivalized terms (log transformed). The key independent variable of interest is the (predicted) number of children. In addition, a number of other demographic and socio-economic variables were used as control variables. The control variables include sex of the household head, age of the household head, female spouse's age at first marriage, education level of the female and the male spouse, contraceptive use, loan receipt, average age

[2] Respondents were asked to give informed consent for the interview. The objective of the research was clearly communicated to them, and they were assured of confidentiality for the information they provided. Whenever they felt uncomfortable to respond to a particular item in the questionnaire or to complete part of the questionnaire, they were free to skip that item or discontinue the interview.

of children born to spouses, money value of assets owned (log transformed) and maternal productive work participation status.

Other variables included in the model were household income and the presence of members other than the couples' own children, as also used in previous research (see e. g. Dupta & Dubey, 2011; Bhasin, Obeng & Bentum-Ennin, 2009; Kim et al., 2009). Also included were farmland size and housing characteristics of the sample households. However, multicolinearity with other variables in the model was detected for the first two variables. In addition, and most importantly, only a minority of rural households (26.6%) were income earners, compared to 96.8% of urban households. This makes it impossible to compare the effect of income for the two subsamples. The income variable has a number of other problems that are further discussed below; and for these reasons, it was dropped from the analysis. Similarly, farmland size and housing characteristics were not included because only an insignificant number of urban households are farming (either doing urban agriculture within the city or cereal cultivation outside the city) and housing characteristics does not make any significant difference among rural households.

Empirical model

Analysis of the causal effect of fertility on the economic well-being of households is complicated by the endogeneity of fertility, which could be caused by omitted variables, measurement error, or simultaneity. Although there are a few studies which failed to find endogeneity (see e.g. Orbeta, 2005 for the Philippines), the fact that fertility is endogenous to poverty indicators is widely acknowledged in the literature. In the presence of endogeneity, the use of the ordinary least squares estimator biases the effect of the number of children since the assumption of the zero covariance between the disturbance term and the independent variables is violated.

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

Following Angrist and Evans (1998), the present study uses the Two Stage Least Squares (2SLS) instrumental variable procedure, which is the most common instrumental variable estimator (Wooldridge, 2009). However, our analysis differs from Angrist and Evans (1998) in that they used the 2SLS model in the context of studying the effect of children on the maternal labor supply of US mothers. The instrumental variable used in this study is sibling sex composition. This instrument was chosen because sex composition of children is random and hence has no direct significant effect on the household's consumption expenditure, while it does impact the number of children.

As described above, the dependent variable is the log of consumption expenditure and the key independent variable of interest is the number of children born to spouses in the selected household. Since the dependent variable, $y_i > 0$ for all valid observations (all households spend on their consumption) and since log-transformed data is assumed to be lognormal (the data in fact passed the Kolmogorov-Smirnov test for normality, and the test for linearity assumptions), we estimate a two-step linear model, which is the 2SLS procedure noted above.

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.

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

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

where, $Ln(Y_{1i})$ is log consumption expenditure of the ith household taken as u unit,

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

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

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 the instrumental variable, sibling sex composition, Z_i (*same sex=1; otherwise, 0*). That is,

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

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

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

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 household's consumption expenditure can be specified by inserting the predicted number of children, Y_{3i}, in place of Y_{2i} as:

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

where, $Ln(Y_{3i})$ is log consumption expenditure of the ith household taken as u unit,

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

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

ε_i is an error term associated to household i.

The estimated consumption expenditure of the household, $Ln(Y_{1i})$, in (7) is now assumed to be unbiased.

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. Not surprisingly, Table 1 shows that households in the urban sub-sample have higher average age at first marriage and child bearing, higher educational attainment, higher average asset value, and higher consumption expenditure compared to households in the rural sub-sample. Table 1 also shows that urban households have fewer and older children and hence fewer household members on average compared to households in the rural sub-sample. The older age and fewer number of urban children is probably due to the delayed age at first marriage (Table 1) and the higher rates of contraceptive use (Table 2) by the relatively better educated urban women.

Table 1: Demographic and economic characteristics of sample households (means) (standard deviation in parentheses)

Variables	Mean values		
	Total	**Urban**	**Rural**
Age of household head	45.0 *(11.09)*	48.5 *(11.54)*	41.5 *(9.44)*
Number of children	4.9 *(2.31)*	4.43 *(2.11)*	5.32 *(2.42)*
Number of household members	7.3 *(2.39)*	7.1 *(2.33)*	7.5 *(2.45)*
Average Age of children	13.3 *(7.83)*	16.1 *(8.83)*	10.5 *(5.39)*
Age at first marriage	15.8 *(3.62)*	17.0 *(3.86)*	14.5 *(2.88)*
Age at bearing first child	18.6 *(3.44)*	19.8 *(3.82)*	17.4 *(2.52)*
Education level of female spouse	3.5 *(4.40)*	5.8 *(4.82)*	1.1 *(2.16)*
Education level of male spouse	5.4 (5.11)	8.8 (4.72)	2.0 (2.68)
Value of household assets	12,780.6 *(16,320.64)*	14,623.4 *(16,900.00)*	10,937.8 *(15,568.72)*
Household per capita consumption expenditure	1166.0 *(672.92)*	1488.6 *(753.34)*	843.4 *(363.19)*
Average hours of work by members (excluding parents)	3.0 *(0.21)*	4.0 *(0.34)*	2.1 *(0.21)*
N	254	127	127

On the other hand, Table 2 shows that urban households have a higher proportion of female-headed households, a lower proportion of households who received loans, a lower rate of female spouse participation in productive work, a lower proportion of households with more than two children, a higher proportion of households with other members in the household and a higher proportion of households with members (excluding parents) working. While the higher proportion of female-headed households and the lower rate of female productive work participation for urban relative to rural households is consistent with previous evidence, the lower rate of loan receipt by urban compared to rural households is surprising since urban households are expected to have better access to loans given their proximity to credit facilities and the relatively capital-intensive nature of urban jobs. The larger proportion of urban children working (Table 2) and the relatively longer hours worked (Table 1) compared to the rural children is also surprising given the traditional, manual labor-intensive nature of the rural economy and the large volume of literature on rural child labor.

Table 2: Demographic and economic characteristics of sample households (frequencies)

Variables	Percentage yes		
	Total	Urban	Rural
Household head is female	18.5	27.6	9.4
Female spouse used contraceptives	51.2	74.8	27.6
Household received loan	43.3	35.4	51.2
Female spouse participated in productive work	46.6	37.3	56.0
Presence of members other than spouses' own children	27.6	44.1	11.0
First two births are same sex	62.6	56.7	68.5
Percentage of households with more than two children	83.1	78.7	87.4
Households with members working (excluding parents)	64.5	66.9	62.1
N	254	127	127

Number of children and household consumption expenditure

As outlined above, the first stage of the Two Stage Least Squares (2SLS) regression predicts the number of children using sex composition of the first two births. The second stage estimates the outcome variable using the number of children predicted in the first stage as the primary independent variable of interest.

The phenomenon of parental preferences for a mixed sibling sex composition has been documented in a number of studies (see e. g. Angrist & Evans, 1998 for the USA; Dupta & Dubey, 2011 for India; Cruces & Galiani, 2007 for Argentina & Mexico; Orbeta, 2005 for the Philippines; and Chun & Oh, 2002 for Korea). For the present study, Tables 3a and 3b compare mean number of children by sibling sex mix. Table 3a shows that, on average, parents with same sex children ultimately have more children compared to those parents having a boy and a girl.

Table 3a: Mean number of children by sibling sex composition

Sex mix	Total		Urban		Rural	
	N	Mean	N	Mean	N	Mean
Same sex	159	5.2	72	4.7	87	5.6
		(2.26)		*(2.14)*		*(2.29)*
One of each sex	95	4.3	55	4.0	40	4.7
		(2.27)		*(2.02)*		*(2.55)*
Total	254	4.9	127	4.4	127	5.3
		(2.31)		*(2.11)*		*(2.41)*

Table 3b shows the mean difference computed by subtracting $MEAN_{SS}$ from $MEAN_{MS}$. The difference in the number of children by sibling sex composition is statistically significant.

Table 3b: Mean difference in the number of children by first born sibling sex mix

Independent variable of interest	Mean difference ($MEAN_{MS} - MEAN_{SS}$)					
	Total		Urban		Rural	
	Difference	*Sig.*	*Difference*	*Sig.*	*Difference*	*Sig.*
Number of children	-.94	.002	-.72	.058	-.97	.034
	(.294)		(.375)		(.455)	
N	254		127		127	

Note: Standard error of mean difference is reported in parenthesis. MS=Mixed sex siblings; SS=Same sex siblings.

Table 4 shows coefficients of sibling sex composition on the number of children from the first stage regression, controlling for other demographic and socio-economic variables. The positive coefficients suggest that parents with same sex siblings will have more children compared to those parents whose first two children are a boy and a girl. The effect is statistically significant though not as strong for the urban sub-sample (significant only at $p<.10$).

Table 4: Parameter coefficient for the number of children by sibling sex composition (with covariates)

Independent variable	Total		Urban		Rural	
	Coef.	*P>t*	*Coef.*	*P>t*	*Coef.*	*P>t*
Same sex siblings	.6183	.002	.2845	.0982	.7276	.012
	(.2111)		(.1946)		(.2966)	
R^2	**0.5649**		**0.7862**		**0.6733**	
N	**248**		**124**		**124**	

Note: standard errors are reported in parenthesis. The independent variables used in the first stage regression include sibling sex mix (the IV, which equals 1 if same sex, otherwise, 0), sex of household head, age of household head, average age of children, female spouse's age of first marriage, educational level of the female and the male spouses, contraceptive use, Ln value of assets owned, loan receipt, and maternal participation in productive work. The dependent variable is the number of children.

Before moving to results from the second stage regression, it is instructive to briefly consider some of the issues raised in a study of consumption expenditure.

Income, consumption expenditure and well-being

There are several issues raised in connection with estimation of material well-being of a given household. Among these, whether to use income or consumption as an indicator of well-being is the most important.

Despite the use of income in official poverty statistics, and despite availability of studies based on income, consumption is the most commonly used indicator of well-being compared to income (see e.g. Aassve & Arpino, 2007; Aredo, Fekadu & Kebede, 2011; Barrett, Crossley & Worswick, 2000; Demeke, Guta & Ferede, 2003; Dercon & Krishnan, 1998; Orbeta, 2003). This is because (1) income can under-estimate or over-estimate well-being through borrowing or saving while consumption is smooth (Demeke et al., 2003; Orbeta, 2003; Aredo et al., 2011), (2) income is prone to under-reporting (Demeke et al., 2003), and (3) income can be interpreted as a

potential to well-being while consumption is interpreted as well-being achievement (Demeke et al., 2003; see also Aredo et al., 2011). Given this limitation of the use of income, consumption expenditure is used in this paper.

Measures of consumption expenditure

The most commonly used measure of consumption expenditure is per capita consumption (Kim et al., 2009), which assumes that the amount of consumption expenditure is equal for each member of a household, and an increase in the number of members is associated with a proportionate increase in consumption expenditure. While most previous research analyzed per capita expenditure, there is an increasing concern expressed regarding the policy implication of this measure of expenditure. This is because assigning equal weight to all household members underestimates the potential size economies offered by age and sex differences in a household (see Greene & Merrick, 2005 and Kim et al., 2009 for a review of this literature). Critics suggest the need to impose an assumption on intra-household resource allocation, and to make an adjustment by applying an equivalence scale that is consistent with the assumption made (Aassve et al., 2005; Greene & Merrick, 2005; Kim et al., 2009). However, there is no agreement on the choice of appropriate equivalence scales, and decisions are often made arbitrarily (Aassve et al., 2005).

Despite this limitation, we use an equivalence scale parameter previously estimated and used by others. This is the adult equivalence scale, which is the weight assigned to children relative to adults. We use a scale estimated by Dercon and Krishnan (1998) in their study on Ethiopia. Using the World Health Organization's conversion codes, they calculated equivalence scales which consider age and sex differences. However, for the purpose of simplicity, we did not use their equivalence scale for sex differences. In addition, we substantially modified the age groups and the scales Dercon and Krishnan (1998: 40) have estimated. Specifically, we assigned a weight of 0.49 for children of ages 0 to 4.99 years; 0.84 for children of ages 5 to 14.99 years; and 1.0 for children of ages 15 years or older.

Given this, we estimate two alternative measures of consumption expenditure.

For per capita consumption, we have:

$$E_p = \frac{E_h}{M_n} \tag{8}$$

where, E_p is per capita consumption expenditure,

E_h is expenditure by the household as a unit,

M_n is number of members in the household

For adult equivalent consumption we have:

$$E_{ae} = \frac{E_h}{(M_{na} + \alpha M_{nc})} \tag{9}$$

Where, E_{ae} is adult equivalent consumption expenditure,

M_{na} is number of adult members of the household,

M_{nc} is number of children as members of the household,

α is the weight of a child relative to an adult

The two different measures of consumption expenditure are described in terms of mean values in Table 5. Not surprisingly, the table shows that consumption expenditure decreases steadily with an increase in the number of children all across the rural and urban samples for both scenarios of consumption expenditure. In addition, the adult equivalent consumption expenditure is higher than the per capita consumption expenditure across the samples. The table also shows that the overall consumption expenditure is higher for urban relative to rural households. This result is in line with the theoretical work which argues against the assumption of per capita consumption. However, given the arbitrary choice of equivalence scales, it remains unclear whether each amount of consumption in fact corresponds with the physiological requirements of members in each age group.

Table 5: Household consumption expenditure by the number of children (Standard deviations in parenthesis)

No. of children	Mean household consumption expenditure					
	Total		Urban		Rural	
	Per capita consumption	Adult equivalent consumption	Per capita consumption	Adult equivalent consumption	Per capita consumption	Adult equivalent consumption
2	1585.9 *(889.2)*	1860.5 *(1056.5)*	1870.6 *(992.7)*	2189.0 *(1189.7)*	1105.4 *(337.2)*	1305.6 *(385.7)*
3-4	1312.2 *(637.7)*	1413.5 *(607.0)*	1557.6 *(723.5)*	1605.2 *(708.3)*	985.0 *(263.0)*	1163.6 *(302.1)*
5-6	1049.5 *(535.1)*	1139.2 *(549.1)*	1339.9 *(578.0)*	1396.6 *(591.8)*	838.3 *(387.5)*	951.9 *(433.9)*
7-8	850.9 *(461.2)*	934.4 *(477.4)*	1184.0 *(451.8)*	1266.8 *(454.3)*	608.6 *(288.0)*	692.7 *(329.7)*
9-10	758.9 *(381.1)*	824.8 *(390.6)*	957.8 *(424.3)*	1011.4 *(444.0)*	560.1 *(206.2)*	638.0 *(228.2)*
>=11	470.8 *(91.7)*	550.7 *(91.6)*	--	--	470.8 *(91.7)*	550.7 *(91.6)*
All children	1166.0 *(672.9)*	1287.8 *(733.4)*	126 1488.6 *(753.3)*	1601.4 *(842.0)*	126 843.4 *(363.2)*	976.8 (420.3)
N	251		126		125	

Two separate regressions were run with the view to see to what extent the effect of the number of children differs across the two alternative measures of consumption expenditure. Table 6 shows the amount of variance in household consumption expenditure explained by the number of children, controlling for other covariates. The table compares results for the different scenarios of consumption expenditure for both the rural and the urban households. The table shows that as expected the R^2 is larger for the OLS than for the 2SLS estimates for both expenditure scenarios across the rural-urban location. Despite the lower R^2 in general, it is statistically significant for both the rural and the urban households showing that the variables are well fitted to the models.

Table 6: Variance explained for consumption expenditure by the number of children

Dependent variables	Model	Total		Urban		Rural	
		R^2	Wald chi^2 (F for OLS)	R^2	Wald chi^2 (F for OLS)	R^2	Wald chi^2 (F for OLS)
Per capita	OLS	39.81	12.13	.3710	4.86	.4324	7.81
consumption	2SLS	.3814	110.02	.1850	50.32	.2901	69.41
Adult equivalent	OLS	.3812	11.89	.4013	5.93	.4506	7.84
consumption	2SLS	.3624	109.97	.3474	71.65	.3328	75.01
N		248		124		124	

Note: Prob > chi^2 (Prob > F for OLS) is statistically significant at $p < 0.05$ for both models and expenditure scenarios across rural-urban location.

Table 7 shows parameter estimates for the two scenarios of household consumption expenditure for both models.[3] The table shows different coefficients for the rural and the urban households. For the rural sub-sample, coefficients are negative for both scenarios and both models, while for the urban sub-sample, they are positive except for the OLS model where coefficients are negative.

The 2SLS coefficients suggest that on average, for those rural households whose two first-born children are the same sex, an increase in the number of children by an additional child leads to a decrease of per capita consumption expenditure and adult equivalent consumption expenditure by 15.3% and 14.9% respectively. For the full sample, consumption expenditure decreases with an increase in the number of children, but the decrease is relatively smaller compared to the rural sub-sample.

By contrast, for the urban sub-sample, an additional child leads to an increase of per capita consumption expenditure and adult equivalent consumption expenditure by 9.1% and 11.5% respectively on average. However, none of the coefficients are statistically significant for the urban sub-sample.

[3] Tables containing coefficients of all control covariates can be provided upon request from the author.

Table 7: Parameter coefficients for household consumption expenditure by the number of children (controlling for covariates)

Dependent variable	Model	Full sample		Urban sub-sample		Rural sub-sample	
		Coef.	P>z (P>t for OLS)	Coef.	P>z (P>t for OLS)	Coef.	P>z (P>t for OLS)
Per capita consumption	OLS	-.1042	.000	-.0647	.216	-.0688	.000
		(.0135)		*(.0274)*		*(.0152)*	
	2SLS	-.1452	.103	.0913	.682	-.1526	0.053
		(.0889)		*(.2205)*		*(.0777)*	
Adult equivalent consumption	OLS	-.1009	.001	-.0602	.321	-.0683	.001
		(.0139)		*(.0259)*		*(.0147)*	
	2SLS	-.1206	. 098	.1152	0.532	-.1487	.061
		(.0815)		*(.2371)*		*(.0765)*	
N		248		124		124	

Note: Standard errors are reported in parenthesis. The independent control variables used in the second stage regression are the same variables used in the first stage except that the sibling sex mix variable was replaced by the predicted number of children as the primary variable of interest.

Discussion and conclusion

Theoretical work relating fertility to household poverty conditions predicts a negative relationship between the number of children and the household's food and essential non-food consumption. This is because, all other things being equal, having a larger number of children means that the resources available to the household are divided among more household members. The analysis shows, however, that the relationship differs by rural and urban location, in line with available empirical evidence on developing economies. That is, despite the substantial consistency with the theoretical prediction of the vast majority of empirical studies in the literature, there remain some studies from developing countries which fail to confirm the theory, suggesting mixed results by rural-urban location within a country and across countries or regions.

For example, in a comparative study of four countries, Aassve et al. (2005) did not find significant heterogeneity in the consumption expenditure between urban and rural areas for Indonesia and Ethiopia. They found that expenditure was higher both for urban and rural areas in Indonesia, and lower both for urban and rural areas in Ethiopia. However, they did find heterogeneity for Vietnam and Albania where farmers were significantly poorer than non-farmers. Also in their Vietnamese study, Aassve and Arpino (2007) report that farmer households with an additional child are substantially more disadvantaged than non-farmers. Similarly, in a study of the effect of fertility on socio-economic well-being of households in northern Ghana, Akazili, Aberese, Aborigo, and Debpuur (2010) found that with more children urban households were significantly likely to be in the richest socio-economic group compared to their rural counterparts.

In terms of country or regional variation, a review of the literature on the relationship between fertility and consumption poverty for developing countries by Schoumaker and Tabutin (1999) note a positive relationship between fertility and consumption for the majority of the studies of countries or regions and a negative relationship for others (see also Kim et al., 2009; Aassve et al., 2005). On the other hand, a review of the literature in the context of the effect of reproductive health outcomes to poverty by Greene and Merrick (2005) concludes that previous evidence on the subject is weak.

The question now is, why is the mixed results? Schoumaker and Tabutin (1999) attribute this to differences in the level of development and fertility transition. That is to say that the relationship is negative for the poorest economies (Aassve & Arpino, 2007; Kim et al., 2009) and tends to be positive for wealthier countries. Greene and Merrick (2005) mention the use of cross-sectional survey data instead of longitudinal data to be the cause of these results. On the other hand, in concluding his review of research in the context of the effect on parental labor supply, Browning (1992) remarks that it is not clear whether children really do have an effect on poverty when endogeneity is considered, or whether this effect is due to instruments that are too weak or simply poorly chosen.

In the present study, the *same sex* instrumental variable as a predictor of the number of children in the first stage regression is statistically significant (Tables 3a & 3b and Table 4). The sibling sex mix is in fact a valid and relevant instrument. A possible explanation is that since urban children were found to be older than rural children (on average 5.6 years older – Table 1), they are more likely to be employed. The percentage of children working was higher for the urban sub-sample compared to the rural sub-sample (67% compared to 62% - Table 2); also, children in the urban sub-sample worked for longer hours compared to their rural counterparts (on average 3.98 hours/day compared to 2.1 hours/day - Table 1). This reinforces the argument that children in the urban sub-sample earned more income and contributed to household expenditures and hence to family well-being. This is surprising given the widespread view drawn from the large volume of literature on rural child labor which holds that rural children are more likely to work (and work for longer hours) than urban children, given the traditional, manual labor-intensive nature of the rural economy. Evidence on the effect of age composition of children on household consumption has also been documented by other studies for other countries (see e.g. Greene & Merrick, 2005 for reviews on Thailand; Aassve et al., 2005 for Albania, Indonesia and Vietnam).

Another possible explanation relates to the rural-urban differences in education and intra-family decision making regarding resource allocation and household spending. There is ample evidence in intra-household studies documenting that, while women generally have lower decision making power on resource allocation in a household, when they do have such control they spend more than men on household consumption in general and on their children's in particular (Basu, 2006; Gitter & Barham, 2008; Shultz, 2002). Using data from the Ethiopian DHS, and focusing on women's own nutritional status, Tebekaw (2011) finds that women's lower decision-making autonomy is associated with their own under-nutrition.

It is intuitively clear that urban women have more decision making power in resource allocation compared to their rural counter-parts. One mechanism by which this occurs is their relatively higher educational level (Table 1), which increases their income. In addition,

education increases the woman's nutritional planning and resource management skills. This suggests that urban women compared to rural women control more resources at their disposal. On the basis of this premise, it seems that consumption expenditure would tend to be higher for urban households even when they have many children.

In conclusion, results for the rural sub-sample (and the full sample) confirm the theoretical prediction that having a higher number of children has an adverse effect on the consumption expenditure of a given household. This is not found to be true for the urban sub-sample. Possible explanations are the higher average age for urban children and the correspondingly higher rate and duration of their participation in productive work, the higher educational attainment of urban women, and a greater allocation of resources on consumption for the household by urban women compared to rural women due to rural-urban differences in decision-making power.

Acknowledgement

This paper has been extracted from a broader research work titled Fertility and Household Economic Wellbeing in Ethiopia: A Case Study in the Amhara Region (Desta, 2012). The research was completed in July 2012. The author is very grateful to the William and Flora Hewlett Foundation, which funded the majority of the research cost. This research work has also benefited from advice and comments by Prof. Bekure Weldesemait (Addis Ababa University). The author is indebted to him.

References

Aassve, A. & Arpino, B. (2007, November). *Estimation of causal effects of fertility on economic wellbeing: Evidence from rural Vietnam* (ISER Working Paper 2007 – 24). University of Essex and University of Florence.

Aassve, A., Engelhardt, H., Francavilla, F., Kedir, A., Kim, J., Mealli, F., ... Prskawetz, A. (2005, October). *Poverty and fertility in less developed countries: A comparative analysis* (ISER Working Paper 2005-13). University of Essex.

Admassie, A. (2002). Explaining the high incidence of child labour in sub-saharan Africa. *African Development Review*, 14(2), 251 – 275.

Akazili, J., Aberese, M., Aborigo, R. & Debpuur, C. (2010). The effect of fertility on socio-economic wellbeing of households in Northern Ghana . *The 10th INDEPTH Annual General and Scientific Meeting*, Accra: 28 September 2010. Retrieved from http://www.indepth-network.org/AGM%202010/Presentations/day2/parallel6/The%20effect%20of%20fertility%20on%20Socio-economic.pdf

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

Aredo, D., Fekadu, B. & Kebede, S. W. (2011). Trade liberalization and poverty: A macro-micro analysis in Ethiopia. Paper for *Proceedings of the German Development Economics Conference,* Berlin: 2011 (http://www.econstor.eu/handle/10419/48283)

Barrett, G. F., Crossley T. F., & Worswick C. (2000, December). *Demographic trends and consumption inequality in Australia between 1975 and 1993* (Review of Income and Wealth, Series 46, Number 4). University of New South Wales, the Australian National University & York University, and Carleton University.

Basu, K. (2006). Gender and say: A model of household behavior with endogenously determined balance of power. *Economic Journal*, 116(511), 558–80.

Bhasin, V. K., Obeng, C. & Bentum-Ennin, I. (2009, March). Fertility, income and poverty of households in Ghana. Paper Presented at the Conference on Economic Development in Africa, St. Catherine's College, Oxford: March 22-24, 2009. Retrieved from http://www.csae.ox.ac.uk/conferences/2009-EDiA/papers/505-Bhasin.pdf

Bloom, D., Canning, D., Fink, G. & Finlay, J. (2007, November). *Fertility, female labor force participation, and the demographic dividend* (NBER Working Paper No. 13583). National Bureau of Economic Research.

Browning, M. (1992). Children and household economic behavior. *Journal of Economic Literature*, 30 (3), 1434-1475.

Chun, H. & 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.

Cruces, G. & Galiani, S. (2007). Fertility and female labor supply in Latin America: New causal evidence. *Labour Economics*, 14, 565-573.

Central Statistical Agency (of Ethiopia) & ORC Macro (2001). *The Ethiopian Demographic Health Survey*, Addis Ababa: Ethiopian Central Statistical Authority & ORC Macro.

Central Statistical Agency (of Ethiopia) & ORC Macro (2006). *The Ethiopian Demographic Health Survey*, Addis Ababa: Ethiopian Central Statistical Agency & ORC Macro.

Central Statistical Agency (of Ethiopia), MEASURE DHS & ICF Macro (2011). *Ethiopia Demographic and Health Survey 2011 (Preliminary report)*, Addis Ababa: Ethiopian Central Statistical Agency & ICF Macro.

Demeke, M., Guta, F. & Ferede, T. (2003, August). *Growth, employment, poverty, and policies in Ethiopia: An empirical investigation* (Issues in Employment and Poverty, Discussion Paper 12). International Labour Office.

Dercon, S. & Krishnan, P. (1998, March). *Changes in poverty in rural Ethiopia 1989 – 1995: Measurement, robustness tests and decomposition* (Working Paper Series /98-7). Centre for the Study of African Economies, University of Oxford.

Desta, C.G. (2012). Fertility and Household Economic Wellbeing in Ethiopia: A Case Study in the Amhara Region. (Unpublished doctoral dissertation). Addis Ababa University, Addis Ababa.

Dupta, N. D. & Dubey, A. (2011). *Poverty and Fertility: An Instrumental Variables Analysis on Indian Micro Data* (Working Paper, No. 03/11). Aarhus University, Department of Economics.

Gebreselassie, T. (2011). The fertility transition in sub-saharan Africa, 1990–2005: How unique is Ethiopia? In Teller, C. and Hailemariam, A. (eds.), *The demographic transition and development in Africa: The unique case of Ethiopia* (pp. 19-44). London/New York: Springer.

Gitter, S. R. & Barham, B. L. (2008). Women's power, conditional cash transfers, and schooling in Nicaragua. *World Bank Economic Review*, 22(2), 271-290.

Greene, M. E. & Merrick, T. (2005, July). *Poverty reduction: Does reproductive health matter?* (HNP Discussion Paper). The World Bank.

Hailemariam, A. Alayu, S. & Teller, C. (2011). The National Population Policy (NPP) of Ethiopia: Achievements, Challenges and Lessons Learned, 1993–2010 (pp. 303-322). In Teller, C. and Hailemariam, A. (eds.), *The demographic transition and development in Africa: The unique case of Ethiopia.* London/New York: Springer.

International Monetary Fund (2006). *The Federal Democratic Republic of Ethiopia: Poverty Reduction Strategy Paper – 2003/04*: *Annual Progress Report (*IMF country report No. 06/27). Washington D. C.: International Monetary Fund.

Kim, J. & & Aassve, A. (2006). *Fertility and its Consequence on Family Labour Supply* (IZA DP No. 2162). Vienna Institute of Demography and IZA Bonn.

Kim, J., Engelhardt, H., Prskawetz, A & Aassve, A. (2009). Does fertility decrease household consumption? An analysis of poverty dynamics and fertility in Indonesia. *Demographic Research,* 20(26), 623-656.

Ministry of Finance and Economic Development (of Ethiopia) (2002). *Ethiopia: Sustainable Development and Poverty Reduction Program*, Addis Ababa: the Ethiopian Ministry of Finance and Economic Development.

Ministry of Finance and Economic Development (of Ethiopia). (2006). *Ethiopia: Building on progress: A plan for accelerated and sustained development to end poverty (PASDEP) (2005/06-2009/10).* Addis Ababa: the Ethiopian Ministry of Finance and Economic Development.

Ministry of Finance and Economic Development (of Ethiopia). (2010). *Growth and transformation plan (2010/11- 2014/15).* Addis Ababa: the Ethiopian Ministry of Finance and Economic Development.

Ministry of Works and Urban Development (of Ethiopia) (2007). *Plan for accelerated and sustained development to end poverty (2005/06-2009/10): Plan for urban development and urban good governance.* Addis Ababa: the Ethiopian Ministry of Work and Urban Development.

Orbeta, A. (2003). Population and poverty: A review of the links, evidence and implications for the Philippines. *Philippine Journal of Development*, 56(2), 195-227.

Orbeta, A. (2005, September). *Children and the labor force participation and earnings of parents in the Philippines.* (Discussion Paper series No. 2005-20). Philippine Institute for Development Studies.

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

Schoumaker, B. and Tabutin, D. (1999), Relationship between poverty and fertility in Southern countries: Knowledge, methodology and cases, Working Paper no 2, Department of Science of Population and Development, Université Catholique de Louvain.

Schultz, T. P. (2002). Why governments should investment more in girls' education. *World Development*, 30(2), 207–225.

Schultz, T. P. (2007). *Fertility in developing countries* (Discussion Paper No. 953). Economic Growth Center, Yale University. Retrieved from http://ssrn.com/abstract=985363.

Tebekaw, Y. (2011). Women's decision-making autonomy and their nutritional status in Ethiopia: Socio-Cultural linking of two MDGs (pp. 105-124). In Teller, C. and Hailemariam, A. (eds.), *The demographic transition and development in Africa: The unique case of Ethiopia.* London/New York: Springer.

Transitional Government of Ethiopia (1993). *The National Population Policy of Ethiopia*. Addis Ababa: the Transitional Government of Ethiopia.

Wooldridge, J. M. (2009). *Introductory econometrics: A modern approach* (4th ed). Mason: South-Western SENGAGE Learning.

United Nations Development Program (2001). *UNDP Review of the Poverty Reduction Strategy Paper (PRSP)*. New York: United Nations Development Programme. Retrieved from http://www.lcgbangladesh.org/PovertyIssues/reports/UNDP%20PRSP%20Assistance.pdf

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

United Nations Population Fund (2010). *State of the world population*: *Monitoring ICPD goals*. New York: United Nations Population Fund.