Levels, Patterns and Determinants of Marital Fertility in low contraceptive Communities of Southern Ethiopia: Experience of resistant to fertility decline

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Abstract

Context: *Ethiopian is experiencing one of the highest population growth rate (about 2.6 percent per annum) mainly as a result of very high fertility rate. Most rural communities in Ethiopia, particularly in southern region, are characterized by low contraceptive practice (less than 10 percent) and consequently experience natural fertility regime. In this regard, some proximate and socio-economic determinants play pivotal role in influencing the current level of fertility.*

Method: *The study is based on primary data collected from 1467 ever-married women selected from one of the most populous district (zone) of southern Ethiopia, and the national level DHS 2005 data. The study has employed the Bongaarts fertility model to estimate the levels and fertility inhibiting effects of some proximate determinants at both zonal (study population) and national level. Also, the study examined the socio-economic determinants of marital fertility using the Multiple Classification Analysis.*

Results: *The study has estimated the relative contribution of each proximate determinant (Marriage, contraception, postpartum infecundability, and abortion) to the current level of fertility in Southern Ethiopia and then compared the results with the national level experiences. Also, the study has estimated the levels of fertility (Total Fertility Rate(TFR), Total Natural Marital Fertility Rate (TN) and Total Fecundity (TF) of the study population.*

Conclusions: *Among the proximate determinants of fertility, postpartum infecundability takes the lion share of fertility inhibition, followed by marriage factors at both zonal and national level. However, the study has found out that there is pronounced variations in some of the proximate determinants in inhibiting fertility at zonal and national level. The findings of the multivariate analysis using MCA model revealed that there exists significant relationship between seven explanatory variables and the dependent variable (children ever born). While Son preference, nutritional status, patriarchal structure and land size are found to have significant positive relationship with fertility, duration of abstinence is known to yield strong negative relationship with the response variable*

I. The context

With an estimated population of about 77 million, Ethiopia is the second most populous country of Africa, next to Nigeria. Fuelled by a high level of fertility rate, the country is experiencing high annual population growth rate of about 2.6 percent. The population increased over the decades from 42.6 million in 1984 to 77 million in 2004. Ethiopia is an agrarian country where agriculture accounts for more than sixty percent of the GDP, employing about 85 percent of the population, and accounts for about 90 percent of the export (CSA, 2000). The country is one of the least developed in the world, with a per capita Gross National Product (GNP) in year 2000 of US $ 98 (GoE, 2000).

Majority of Ethiopians have little or no education; 62 percent of males and 77 percent of females have no education, 27 percent of males and 17 percent of females have only some primary education, less than 3 percent of males and 1 percent of females have attended (but not completed) secondary level education. Only less than 4 percent of the population completed secondary or higher education. It is estimated that about 75 percent of the population suffers from some type of communicable diseases and malnutrition (TGE, 1995). It is estimated that about 50-60 percent of the population is chronically food insecure and more than half of the children below the age of five are stunted; 11 percent of the children are moderately wasted and 1 percent of these children are severely wasted (CSA, 2000). Life expectancy at birth, as an indicator of the health status of the population, is estimated to be about 42 years (PRB, 2003) and the more sensitive indicator, infant mortality rate is 107 per 1000 births, whereas the average sub Saharan Africa IMR is less than 100 per 1000 live births (PRB, 2003). On top of these, maternal mortality ratio in the year 2003 was above 895 per 100,000 births, which is one of the highest in the world (PRB, 2003; CSA, 2000).

Among the nine federal states of the country (Amhara, Oromia, Tigrai, Afar, Somalia, Gambella, Benishangul, Region 14, and SNNPR), the Southern Nations ,Nationalities and Peoples Region (SNNPR) , which is the concern of this study, is located in the southern part of the country. With an area of 113,539 square kilometers, it accounts for about 10 percent of the total area of the country. The region is constitute of twelve sub-regional administrative areas called ‘Zones’ classified on the basis of ethnicity (Sidama , Guraghe, Hadya , Wolaita , Bench Maji, Semen Omo, Debub Omo, Gedeo , Keficho , Kembatta, Alaba Tembaro, and Silti ,).In the year 2000, the population of the region was estimated at about 12.5 million, of which 6.2 million male and 6.3 million were female population. The region’s population accounts for 20 percent of the total population of the country, which makes it the third populous region in the country next to Oromia and Amhara federal states (SNNPR, 2001; CSA, 2000).

The population profile of the region is characterized by large number of children under 15 (46.7 percent) while those in the age group 15-64 and above 64 accounts for 50 and 3.3 percent respectively. The median age of the population in the year 2001 was estimated to be about 17 years, which again indicates high prevalence of dependency and high population momentum in the years to come. Out of the total population of the region, women in the reproductive age (15-49) account for about 2,970,650 in the year 2000 (47.3 percent of the total female population of the region). Out of these, only 8 percent live in urban areas while 92 percent reside in rural areas of the region. About 53.9 percent of children are stunted, 12 percent are severely wasted and 52.5 percent are under weight (CSA, 2000)..On top of these, the region exhibits one of the lowest health service coverage in the country (RBOH, 1998). Lack of good antenatal delivery, poor postpartum care, malnutrition, anemia, high fertility and the like contributed to the high regional maternal mortality rate. Moreover, sexually transmitted diseases are among the major health concern of the region. Currently, the HIV cases are increasing very alarmingly and threatening the health status of the citizens and thereby bringing about serious socio-economic consequences in the region.

Sidama zone is one of the 13 zones found in SNNPRG. It is found in the northeastern part of the region and it is bordered by Oromiya federal state in the north, east and southeast, with Gedeo zone in the South, and North Omo zone in the west (see the map on page vi).The zone has a total area of 7200 Km^2 divided into ten sub-zones , locally called '*woredas*' and two administrative towns. These ten woredas are ; Awassa, Shebedino, Dalle, Aleta Wondo, Darra, Hagere-selam, Arorresa, Bensa, Arbegona, and Boricha wordas and the two towns administrations of Yirgalem and Aleta wondo. .Among all *woredas* , Dale is the largest with a total area of 1494.630Km^2 while the smallest is Darra with 263.360 km^2. The zone has different landform characteristics varied from high mountains to low lands, as it is true for different parts of the country. According to the recent estimate, the zone's total population is about 3 million with an average density of 386 persons per km^2 , making it one of the densely populated zone in the region. There is high variation in the population growth rate of rural and urban areas, which is 4.11 and 2.23 percent per annum respectively. Protestant chirstians account for the majority followed by orthodox Christian, catholic and Islam.

Having revisited the socio-economic and demographic profiles of the country and the region concerned, it is important to capitalize on the fertility scenarios. According to recent estimate, the overall contraceptive prevalence for the country is about 15 percent (CSA, 2005). In the study area, Southern federal state, the scenario is even worse, with over all contraceptive prevalence of less than 10 percent, which even comes down to almost nil if one looks at the sub district level (SNNPR, 2001). The high and sustained "natural fertility " in the region can also be inferred from the current level of TFR of some districts or zones which is ranging between 5.6 for Kembatta district to 7.9 in Sidama (DTRC, 1998) varying mainly due to differences in socio cultural experiences across communities.

In this region, where about 45 ethnic groups exist and where all fertility indicators are among the highest in the country standard, investigation of the levels and determinants of fertility has paramount importance. So far, a very few empirical studies have been conducted to identify the key determinants of fertility among such communities in Ethiopia, and thus, this study is hoped to make significant contribution to the planning and implementation endeavour of population programs and policies at the regional and the country level as well.

II. Objectives of the study

The major objective of this study is to estimate the levels and determinants of fertility of the study population using some appropriate demographic and multivariate models.

III. Data and Method

The input data for this study was generated through primary source. The study population is ever married women in the conventional age group 15-49 who were selected from the population of one district (Administrative zones) of the Southern Federal Government. Two Questionnaires were developed to collect data for the study; the household and individual questionnaire. The data were collected from the sample households for four consecutive months.

In order to make estimation of fertility of the region possible, a total sample size of 1140 households is statistically significant (i.e. 1140 is minimum required sample size statistically estimated). As indicated in section two above, there are twelve zones in the southern region, almost all having similar level of fertility (TFR of about 6). The study zone (Sidama) was purposefully selected among the twelve zones of the region due to the fact that the zone is the most populous with the lowest level of contraceptive prevalence, experiencing one of the highest fertility (TFR of above 6) and owns highest proportion of women in the age group 15-49, indicating high potentials for increasing population.

Generation of sampling of ever-married women (age 15-49) begun with the listing of all village segments or locally known as *"Kebeles"*. Then, two stages proportionate stratified sampling technique was used to ensure that the different groups of the population are adequately represented in the sample. At the first stage of sampling, a total of twenty-four area segments were selected from a total of 110 segments using systematic sampling technique. At the second stage of sampling, a total of 1140 households were selected using systematic sampling technique and all eligible women were interviewed. The ultimate total number of eligible women interviewed was 1467.

The data were coded and four experienced data entry operators carried out the data entry. Data re-coding and cleaning were performed following data entry. The quantitative data were analyzed using computer software called Statistical Package for Social Sciences (SPSS). The levels of fertility was estimated using the Bongaarts fertility model while the socio-economic determinants were examined through the Multiple Classification Analysis (MCA).

IV. Background Characteristics of the Respondents

Information on the respondent's background characteristics, such as age, marital status, educational status, religious status and the like was collected. The percentage distributions of these background characteristics are given in table 1 below.

The age distribution of the respondents given on table 1. reveals that majority of them are represented from the age group 25-29 (26.8%) followed by age group 30-34 (26.3 %) and age group 35-39 (22.2%). Small proportions, 2.8 and 2.1 percent, represent respondents from very young and older age group, 15-19 and 45-49 respectively. With regards to the marital status distribution of respondents, it can be observed that the majority of women (93.9%) are currently in union while the divorced, separated and widowed women account for very small proportion of the sample population. The divorced, separated, and widowed women altogether account for only 6.1 percent of the total sample women.

Another background variable shown in table 1 is religion. The majority of the respondents are protestant Christians (87.4%) followed by Catholic (5.0%) and Orthodox Christians (4.5%) while Islam and Traditional religions account for very small proportion of the respondents. The religious distribution of the sample women is quite different from the distributions at national level. If one looks into the national population data for the year 2000, the Orthodox Christians accounts for about 51 percent of the total population of the country followed by Islam (35%). Contrary to this, the Southern part of Ethiopia is predominantly of Protestant Christians where missionary activities have been very strong and existed for the last many decades, and also accounts for the bulk of the proportion of Protestant religion in the national census

Table 1. Percentage distributions of respondents by background characteristics,Sidama zone , SNNNPRG, 2005

Characteristics	*Frequency (n=1467)*	*Percent*
Age of respondent		
15-19	41	2.8
20-24	149	10.2
25-29	393	26.8
30-34	386	26.3
35-39	326	22.2
40-44	141	9.6
45-49	31	2.1
Current marital status		
Divorced	12	0.8
Separated	9	0.6
Widowed	69	4.7
Currently married	1377	93.9
Religious status of the respondent		
Orthodox Christian	72	4.8
Catholic	73	5.0
Protestant	1282	87.4
lslam	39	2.7
Traditional	1	0.1
Educational status of respondent		
Primary (1-6)	323	22.0
Junior secondary (7-8)	75	5.1
High school (9-12)	34	2.3
Diploma (12^{+2})	1	0.1
Illiterate	1034	70.5

		Contd……….
Husband's level of education		
Elementary (1-6)	452	30.7
Junior secondary (7.8)	345	23.5
Secondary (9-10)	229	15.6
College diploma	7	0.6
Illiterate	434	29.6
Marital form		
Polygamous	224	15.3
Monogamous	1243	84.7
Age at first marriage		
Less than 15	339	23.1
15-19	973	66.3
20-24	132	9.0
25 and above	23	1.6
Current use of family planning methods		
Currently using	91	6.2
Currently not using	1376	93.8
Future plan (intention) to use family planning		
Yes	1114	75.9
No	353	24.1
Work status of the respondent		
Self employed	148	10.1
Civil servant	38	2.6
Farmer	1036	70.6
Petty trader	156	10.6
Others	89	6.1
Standard of Living Index (SLI)		
Low	1247	85.0
Medium	207	14.1
High	13	0.9

As expected, majority of the respondents fall under illiterate category (70.5%), about 22.0% have attained primary level of education and very small proportions are reported to have gone higher than primary level. The percentage distribution of the husbands by educational status reveals better picture compared to that of the respondents. Relatively larger number of the husbands attained primary and junior high school while still the proportion of illiterate husbands accounts the majority.Respondents were also asked to indicate whether their husband has another wife or not, and the rank they own among the wives. This simple and direct forward question helped in identifying whether the respondent is in monogamous or polygamous union. Accordingly, 15.3 percent of the respondents reported that their husband has another wife. This proportion is almost exactly the same as the proportion (14%) of polygamous women at regional level survey of year 2000.

Age at first marriage of respondents is presented in table 1.above .In many societies; age at marriage marks the point in women's life when childbearing becomes socially acceptable. This is also to mean that women who marry early will on average have a longer exposure to the risk of pregnancy resulting in higher level of fertility in the absence of effective contraceptive use. In this study, information on age at first marriage was obtained by asking all ever-married respondents the month and year they started living together with their first spouse. It is seen from the table that the majority of the sample women (66.3%) got married between age 15-19, which is very early compared to many other populations in fertility transition. The proportion reported to get married before age 15 is also very high (23.1 %). Table 1 also shows the work status of respondents during the last 12 months preceding the survey. The majority of the respondents (70.6%) reported to spend most of their time in direct agricultural activities. The fact that the input data for this study were collected from the rural districts only, it is natural to expect the majority of the respondents to be engaged in direct agricultural activities.

Finally, the table presents the standard of living index (SLI) as an alternative method of measuring economic status of households in a situation where information on household income is very difficult to get. Here, it is focused on the traditional practice of using proxy variables to measure economic status, owing to the fact that report on household income is unreliable. Montgomery et al (2000) assumed that ownership of durable goods and housing quality are proxies for the preferred measure of household economy. They derived 17 consumer durable goods such as sewing machine, stove, refrigerator or freezer, air conditioner, fan, radio, cassette player, photograph, stereo equipment, washing matching, black and white television, color television, bicycle, motorbike, car, and camera. (Montgomery 2000) .In this study, by composing the household ownership of selected items (land, bike, Bullock, Cattle, and the like), an index ranging 0 to 100 was developed. Accordingly, 85% of the households fall under low SIL category while only 14.1 and 9.9 percent are reported to fall under average and high level of SLI respectively.

V. Results and Discussion

5.1 Brief summary and analysis of Fertility Transition in Ethiopia

One of the difficulties of studying fertility trends and differentials is that detailed and complete data are lacking except that the country has recently conducted the two DHSs in the year 2000 and 2005, which are considered as the most comprehensive and national representative data with better quality and quantity of fertility related information. However, it is true that a great deal of attempt was made to examine the trends of fertility in the country using both small micro level and macro level data. As most of these endeavors based their analysis on inadequate data set, it has become difficult to confidently describe both the fertility trends and historical fertility transitions. Despite these difficulties, this study tries to summarize the trends using the available secondary data at national level. The 1984 census, the first census for the country, offered very poor qualities and quantity of fertility data. However, after considerable analysis and adjustment , the CSA reported a TFR of 7.5 (CSA, 1991). Using the same data set, Hailemariam estimated an adjusted TFR of 6.0 and 7.4 for urban and rural Ethiopia respectively (Hailemariam, 1992).The 1990 survey results shown an adjusted TFR ranging from 7.3 to 8.0 with 7.7 being the preferred figure (CSA, 1993; Hailemariam, 1992).The 1994 data, though it also suffered from errors, offered an adjusted TFR of 7.0.

Table 2 Reported mean children ever born from Ethiopian national level data (1984,1990 1994, 2000 and 2005).

Age group	*1984 Census*	*1990 Survey*	*1994 Census*	*2000 DHS*	*2005 DHS*
15-19	0.4	0.3	0.2	0.15	0.15
20-24	1.7	1.7	1.3	1.20	1.01
25-29	2.8	3.3	2.8	2.65	2.50
30-34	3.9	4.9	4.4	4.57	3.18
35-39	4.6	5.9	5.4	5.66	4.77
40-44	5.0	6.6	5.9	6.74	5.25
45-49	5.2	6.9	6.1	7.23	5.50

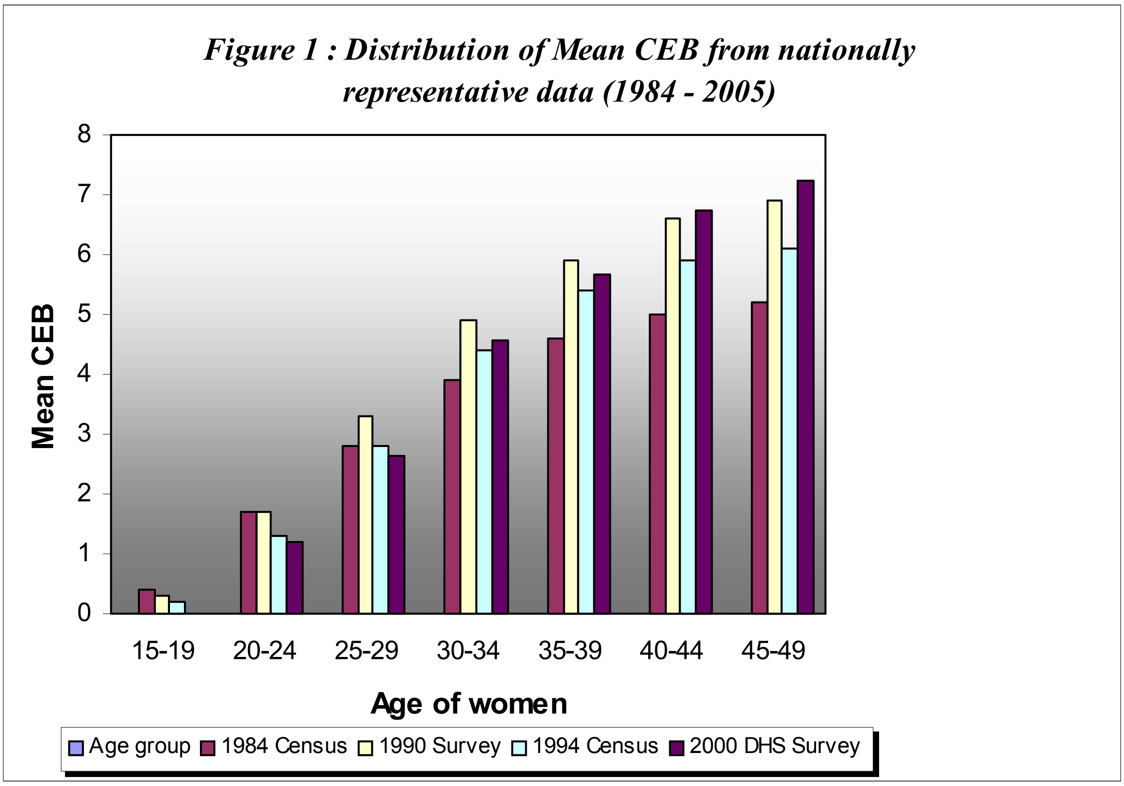

Table 3 below presents several measures of current fertility at national level (Age Specific Fertility Rates, Total Fertility Rates, Crude Birth Rate and General Fertility Rate). Overall, it is understood that the country exhibits higher level of Total Fertility Rate (5.4 children per woman) with big rural-urban differentials (2.0 and 6.0 respectively). Both the Crude Birth and General Fertility Rates are among the highest in Africa.

Table 3 Age Specific Fertility Rates (ASFRs) and Total Fertility Rate , General Fertility Rate (GFR) and Crude Birth Rate (CBR) for Ethiopia, 2005.

	Residence		
Age group	*Urban*	*Rural*	*Total*
15-19	35	122	104
20-24	105	260	228
25-29	133	261	241
30-34	101	253	231
35-39	58	178	160
40-44	28	94	84
45-49	14	38	34
TFR	**2.4**	**6.0**	**5.4**
GFR	**77**	**200**	**179**
CBR	**23.4**	**37.3**	**35.7**

5.2 Levels of fertility and its inhibiting effects of proximate determinants.

It is very difficult to set a clear linear relationship between direct and indirect variables affecting fertility. One difficulty inherent in trying to understand the complex nature of the relationship arises in attempting to specify the theoretical fertility determinants themselves. Because of the multiplicity of factors that can affect human reproduction, it is useful to have a general framework, which ideally provides a comprehensive and coherent list of the components that affect human fertility and their interrelationships. To this end, numerous theoretical and conceptual frameworks have been devised over the years by such known scholars as Davis and Blake (1956), Freedman (1967), Easterlin (1975), World Fertility Survey (1984), Bongaarts (1978,1983) and others.

Davis and Blake have identified the first systematic classification of the specific biosocial factors or mechanisms, which are directly related to fertility. These factors are called the *"intermediate* " fertility variables (Davis and Blake, 1956) because they mediate between fertility and various social, cultural, economic and biological variables. The Davis and Blake sociological framework provides a comprehensive and systematic set of eleven intermediate fertility variables grouped into three necessary and socially recognized steps in reproduction: 1) Those factors affecting exposure to intercourse (such as age of entry into sexual union, proportion of women never entered into sexual union or permanent celibacy, amount of the reproductive period spent after or within union, voluntary abstinence, involuntary abstinence, and coital frequency) 2) Those factors affecting exposure to conception (such as fecundity or infecundity by involuntary causes, use or non use of contraception, and fecundity or infecundity by voluntary causes); 3) Those factors affecting gestation and parturition (such as fetal mortality from voluntary causes , and fetal mortality from involuntary causes).According to this framework, each of the eleven intermediate fertility variables may have a negative or positive effect on fertility .The effects of the socioeconomic and demographic variables usually work through these intermediate variables.

Here, postpartum amenorrhea (which is the function of breast feeding), as a variable and as a concept, was missing from the list of the intermediate variables developed by Davis and Blake. The work of Luis Henry (1961) emphasized this important variable and provided two additional components to build comprehensive and analytical model of fertility determinants. These two elements were; "natural fertility "which was first defined by Henry and "birth interval". Luis Henry's approach produced almost the same and overlapping list of proximate (direct) determinants with Davis and Blake, except that he emphasized on the impotence of studying ‘natural fertility’ which became an important model for studying the fertility experiences of pre-industrial or agrarian communities.

The most refined model of fertility determinants was given by Bongaarts. Bongaarts has showed that there are seven intermediate variables through which social,economic and cultural factors affect fertility, and these are ;Marriage,contraception,induced abortion, post partum infecundability ,spontaneous intra uterine mortality and sterility. In his later analysis of different populations, he presented evidence that most of the variations in fertility levels among natural populations is attributable to just four intermediate or *“:Proximate* “ determinants :Marriage, contraception, abortion, and post partum infecundability. The model presupposes that any factor – environmental, social, economic or cultural-which affects fertility must go through one or more of the proximate variables, suggesting that these variables can affect fertility only indirectly by modifying the proximate determinants.

The Bongaarts model expresses the impact of each of the four proximate variables in terms of the extent to which it reduces overall fertility. It should be noted that Bongaarts’ work represented a significant advance over previous attempts in quantifying and modeling fertility levels in that it presented a simple model that could readily be applied using available data.

The model is commonly used to estimate various fertility parameters such as: decomposing the contribution of each proximate variables to over all fertility; analyzing the contribution of change in the proximate determinants over time; comparing the difference in fertility between two countries or regions on the basis of difference in the proximate variables; estimate total abortion rate and projecting future levels of contraceptive use that would be required to achieve fertility goals given expected changes in other proximate determinants. Since its development in early 1980’s, the model was applied to many populations to estimate one or more of the fertility parameters mentioned above, and more than hundred publications on its use have appeared during the last two decades (Stover 1997).

Despite the wide use of the model, it is evident that it may not always be best fits in some populations (i.e it may over estimate or under estimate the levels of fertility). In Ethiopia, very few attempts were made to apply the data both at national and district level mainly due to lack of appropriate data. The model was used for the first time in 1994 (Hailemariam et’al, 1994) for the 1990 national level data.

In this section, attempt is made to estimate the level of fertility (TFR, TN and TF) and measure the contribution of each of the four proximate determinants to the current level of fertility of two sets of population (Zonal/regional and national) using the Bongaarts model.

5.2.1 The model and estimation of indices

To begin with, the model presupposes that the fertility inhibiting impact of the four principal determinants of fertility is measured by the four indices mentioned above. Each index takes a value of zero or one: It is equal to zero if fertility inhibition is complete and equal to one if there is no fertility inhibition effect of the individual variable. Bongaarts developed a multiplicative model to quantify the relationship between these indices and the Total Fertility Rate (TFR) The model is given by:

$$\mathbf{TFR = C_m \times C_c \times C_a \times C_i \times TF}$$

Hence, using the basic Bongaarts model, the following relationship is derived:

$$\mathbf{C_m = TFR/TM}$$

$$\mathbf{C_c \times C_a = TM/TN}$$

$$\mathbf{C_i = TN/TF}$$

Rearranging the above equations, will give;

$$\mathbf{TFR = C_m \times TM}$$

$$\mathbf{TM = C_c \times Ca \times TN}$$

$$\mathbf{TN = C_i \times TF}$$

To show that the indices equal the proportions to which fertility is reduced as a result of the corresponding inhibiting effects;

$$\mathbf{TFR = C_m \times Cc \times Ca \times C_i \times TF}$$

$$\mathbf{TM = Cc \times Ca \times C_i \times TF}$$

$$\mathbf{TN = C_i \times TF} \quad ,$$

Where

C_m = Index of Marriage (equals 1 if all women of reproductive age are married and 0 in the absence of marriage.

C_c = Index of contraception (equals 1 in the absence of contraception and 0 if all fecund women use 100 percent effective contraception).

C_a = Index of induced abortion (equals 1 in the absence of induced abortion and 0 if all pregnancies are aborted).

C_i = Index of post partum infecundability (equals 1 in the absence of post partum infecundabilty and abstinence and 0 if duration of infecundabilty is infinitive).

TF = Total fecundity which falls within the range of 13 to 17.

In relation to the model, four different types of fertility levels are identified, each having significant implications for the growth rate and change of a population. With the inhibiting effects of all proximate determinants shown above, a population's actual level of fertility is measured by the Total Fertility Rate (TFR). If the fertility-inhibiting effect of delayed marriage and marital disruption is removed without other changes in fertility behavior, fertility will increase to a level of the Total Marital Fertility Rate (TM). If all the practice of contraception and induced abortion is also eliminated, fertility will rise further to a level of the Total Natural Fertility Rate (TN). Finally, if the practice of lactation and post partum abstinence are removed, fertility will further rise to a level called Total Fecundity (TF). It is noted here that the three levels of fertility (TFR,TM and TN) vary widely among different populations while the TFs of most populations fall within the range of 13 to 17 births per woman, with an average of about 15.

Index of marriage (Cm)

It is the function of age at marriage, age at cohabitation and separation due to divorce or death of husband. Bongaarts measures sub-sum of these effects into one index called *"Index of marriage "* which is computed as the sum of age specific proportion of married, m(a)), multiplied by age specific marital fertility rates g((a) , divided by the sum of age specific marital fertility rates. The index is computed only for women in the age group 15-49 and is given by:

$$\mathbf{C_m = \sum m\ (a)\ {*}g(a)\ /\ \sum g(a) = TFR/TMFR = S}$$

The basic assumption behind this index is that marriage makes the beginning of sexual intercourse and a woman does not engage in sexual relation in the absence of her spouse. It should be noted that marital fertility (fertility occurring only within marriage) is affected by the proportion of women in union, the mean age at first marriage, the incidence of widowhood, divorce and remarriage. In populations, like Ethiopia, where voluntary birth controls are not practiced (Contraceptive prevalence rate of only 8 percent) and where child bearing outside wedlock is uncommon, the age at which first marriage takes place and the proportion of women in union are important determinants of fertility (Hailemariam et'al ,1994; Bongaarts 1983).

Stover (1997) suggested the sexual activity (S) as better alternative for measuring the index of marriage with the view that S directly measures the level of exposure to pregnancy. According to Stover, the sexual activity index is defined as proportion of women 15-49 sexually active (active referring to having sexual intercourse in the last month) and do not use contraception. For the sample population, the value of S is about 85.5 (the percentage of reporting having sexual intercourse during the last month). In this study, the ratio of TFR/TMFR = 6.1/7.41 (see previous discussions), which is 0.82, is used to measure the level of C_m. For the national data, the value of S is estimated at about 77 percent (C_m = 0.77).

Index of Post Partum Infecundability (C_i)

The temporary absence of menstruation after birth is generally called " Lactational Amenorrhoea" where breast-feeding is the principal determinant. The duration of breast-feeding determines the length of birth intervals through hormonal suppression of ovulation by delaying resumption of ovulation after birth. Bongaarts has measured the index of post partum infecundability as :

$$C_i = 20/18+i$$

$$i = 1.753\, e^{0.13968B-0.001872B2}$$

Where i is the mean duration of post partum ammenorrhoea estimated from the mean duration of breast-feeding or lactation (B) of the populations concerned.

Table 4. Estimation of C_i from mean duration of breast feeding,Sidama zone and Ethiopia,2005.

Birth order	No of births	Mean duration of breast feeding
1st	113	21.3
2nd	113	21.5
3rd	113	21.9
4th	161	24.8
5th	260	24.2
6th	223	27.2
7th	167	28.9
8th	141	29.6
9ht	79	29.6
10th	37	32.1
11th	26	31.7
11+	3	36.0
Average (Sidama Zone)		**B = 25.8**
***Average (Ethiopia)**	**Computed from DHS*	**B = 17.9**

$$i = 1.753\, e^{0.13968(B) - 0.001872(B2)} = 18.5 \text{ months (Study Population)}$$

$$i = 1.753\, e^{0.13968(B) - 0.001872(B2)} = 12.0 \text{ months (National level)}$$

Then the index of lactational infecundability C_i for the study population is given by:

$$Ci = 20/18+i \quad = 20/18+18.5 = 0.54 \text{ (Study Population)}$$

$$Ci = 20/18+i = 20/18+12.0 = 0.67 \quad \text{(National level)}$$

Index of non contraception (C_c)

The use of contraception reduces the level of Natural fertility to a level of marital fertility, TM,. The effects of contraception depends on use –effectiveness (e) of user which measures the protection of an individual user from unintended pregnancy. While estimation of contraceptive use rate (U) can directly be estimated from the survey data, the use-effectiveness (e) is usually not available for many countries. Bongaarts used the 'e' values of 0.85 of Philippines to represent the developing countries. Since the study population is experiencing very low level of contraception, about 6.2 percent (see table 1 above) , the e value of 0.85 is directly used without further treatment.

Sample Population	***National Level***
C_c = 1-1.08 x u x e **= 1-1.08 x 0.062 x 0.85** **= 0.96**	**C_c = 1-1.08 x u x e** **= 1-1.08 x 0.14 x 0.85** **= 0.87**

The prevalence of contraceptive use has been one of the most important factors behind fast decline in fertility of western countries in the 20^{th} century. It is also believed to be responsible for fertility transition in many developing countries during the last 30 years. In Ethiopia, contraceptive prevalence rate was 4.8 in 1990 and increased to about 8 percent in year 2000 and then 14 percent in the year 2005 (CSA, 2000/2005). The study population is experiencing lower contraceptive prevalence than the region's and country's average.

Index of induced abortion (Ca).

The level of natural fertility is also reduced by the induced abortion .The index of induced abortion is given by:

Ca = TFR/TFR + 0.4*(1-U)*TA , where TA is the total abortion rate.

Since abortion is not acceptable in rural areas of Ethiopia except in a few cases such as pregnancy from rape, threat to mother's life and the like mainly due to very strong stigma associated with abortion experience, information is usually under reported. Thus, in this study too abortion was not reported well, and hence, the index of abortion is assumed to be zero.

Total Fecundity (TF)

The total fecundity is the total fertility rate in the absence of the fertility inhibiting effects of the proximate determinants. Bongaarts estimated the TFs of most populations to fall within the range of 13 to 17 births per woman, with an average of about 15.3. In this study the Bongaarts' average TF value is used.

5.2.2 Fertility inhibiting effects of the proximate determinants

As clearly mentioned above, each proximate determinant is considered as inhibitor of fertility. Its fertility inhibiting effect is estimated by comparing fertility in the presence and in the absence of inhibiting effects caused by the individual factor. This implies that a population's actual level of fertility is measured by its Total Fertility Rate (TFR) when the inhibiting effects of all proximate determinants are present. If the fertility-inhibiting effect of delayed marriage and marital disruption is removed without other changes in fertility behavior, fertility will increase to a level of the Total Marital Fertility Rate (TM). If all the practice of contraception and induced abortion is also eliminated, fertility will rise further to a level of the Total Natural Fertility Rate (TN). Finally, if the practice of lactation and post partum abstinence are removed, fertility will further rise to a level called Total Fecundity (TF).

Table 4 below presents the magnitude of the total inhibiting effect being accounted by each proximate fertility determinants. It should be noted here that the compliment of each index is equal to the proportionate reduction of fertility due to the particular index. For example, a value of 0.94 for Cc implies that the effect of contraception is to reduce the Total Natural Marital Fertility (TN) by about six percent. Like wise, the remaining values of the proximate determinants can be interpreted.

The summary of the estimated indices (C_m x Cc x Ca x Ci) given in the first column of table 4 reveals that marriage index (C_m = 0.82) reduced the Total Marital Fertility Rate (TMFR) by 18 percent –or equivalently it is interpreted as – TFR is 82 percent of the TMFR as a result of marriage effect. For the national data, marriage index (Cm = 0.77) reduced the TMFR by 23 percent The estimated value of contraception (Cc = 0.94) can be interpreted as; Total Natural Marital Fertility Rate (TN) is reduced to the level of TMFR only by 6 percent- or- TMFR is 94 percent of TN as a result of non-contraception use. For the national data, Cc = 0.87 reduced the TN to the level of TMFR by 13 percent. Similarly, the estimated value for post partum infecundability (Cc= 0.54) implies that the Total Fecundity (TF) is reduced to TN by 46 percent as a result of universal breast feeding practices in the population- or- it can be understood as that the TN is only 54 percent of the TF. Also, the national level estimate Ci = 0.67 indicates that TF is reduced to TN by 33 percent.

Table 5. Summary of the contribution of the four proximate determinants to the reduction of the level of fertility, Sidama zone and National level, 2005.	
Model Indices (Zonal/regional level)	**Model Indices (National level)**
Cm = 0.82	Cm = 0.77
Cc = 0.94	Cc = 0.87
Ca = 1.00	Ca = 1.00
C_i = 0.54	C_i = 0.67
Over all Inhibiting effects of the combined indices (Cm x Cc x Ca x C_i) = **0.416 = (TF is reduced to TFR by 58.4 % 8.9 births)**	Over all Inhibiting effects of the combined indices (Cm x Cc x Ca x C_i) = **0.469 = (TF is reduced to TFR by 53.1 % 9.9 births)**
Note: TFR estimated = 6.4 birth ***TN estimated = 8.3*** ***TF = 15.3***	***Note: TFR estimated = 5.4 birth*** ***TN estimated = 9.25*** ***TF = 15.3***

5.3 Socio-Economic Determinants of Marital Fertility

In order to examine the relative importance of each independent variable to the dependent variable, by controlling all the confounding effects, multivariate analysis (using multiple classification analysis) was employed. In this section eleven independent variables (predictors) were entertained in the multivariate analysis model, the selection of which was based on the theoretical background and the best fit model criteria.

In this regard, some traditional fertility influencing variables such as work status; contraceptive use and some community level variables were not included in the analysis. The exclusion of work status from the multivariate analysis, for instance, has two grounds: First, the study population is homogeneous and nearly all the respondents are unpaid family workers (see table 5) which entails that the role incompatibility and opportunity cost hypothesis are not applicable. Second, in the absence of detailed work histories, it is not possible to estimate the net effects in which work in a particular period is related to the number of births or the probability of having a birth in that or a later period. The exclusion of contraceptive use as a predictor variable is direct forward i.e the study population, from the very beginning is known to experience a natural fertility regime in which only small proportion of the total population experiences voluntary control of birth.

5.3.1The model

Multiple Classification Analysis (MCA) is one of the commonly used techniques of multivariate data analysis commonly employed to examine the contribution of each category of the predetermined predictor variables before and after adjustment for the controlling variables. It is an ordinary linear multivariate regression model consisting of the nominal variables as dummies. Multiple classification analysis is a technique for analyzing interrelationships between several predictor variables and a dependent variable within the context of an additive model. The predictors in an MCA can be measured either in ordinal or nominal scale. The dependent variable has to be either in interval scale or in dichotomous category.

Let Y_{ijklw} denotes the individual score on the number of children ever born (dependent variable) to W^{th} woman belonging to the i^{th} category of the variable ‘ income ‘ , j^{th} category of the variable ‘education’ , k^{th} category of the variable ‘ ethnicity ‘ , and l^{th} category of the variable ‘ religion’ .Then, the model can be expressed in simple terms as:

$$\mathbf{Y_{ijklw}} = ά + a_i + b_j + c_k + d_l + e_{ijklw}$$

Where ά = General effect

a_i = Effects of the ith category of the variable ‘income’

b_j = effect of the j^{th} category of the variable ‘ education’

c_k = effect of the k^{th} category of the variable ‘ ethnicity’

d_l = effect of the l^{th} category of the variable ‘religion’

e_{ijklw}= residual terms not accounted for by the variables taken in the model.

$$\text{Let } \tilde{Y} = ά + a + b + c + d$$

$$Y_{ijklw} - \tilde{Y} = (a_i - a) + (b_j - b) + (c_k - c) + (d_l - d) + e_{ijklw}$$

The unknown constants a_i,b_j,c_k, and d_i are estimated by ordinary least square (OLS) procedure The MCA procedure provides figures and estimates for each predictor: It provides estimates of the “unadjusted” and “adjusted” effects of each of the independent variable on the response variable. The unadjusted effect (deviation) of a particular category of A (A_1 for example) is equal to mean value of Y among those belonging to category 1 of A minus overall mean of Y values of 1. This simply illustrates the extent to which values among women of first category of A differ from the overall mean value of Y. This does not reflect the effect since the distribution of women according to the levels in other predictors may be different for women belonging to category 1 of A.

The MCA table also provides Eta (ή) which indicates the ability of a predictor, using the categories given, to explain variations in the dependent variable: Eta squared (ή^2) which is the correlation ratio indicating the proportion of the total sum of squares explainable by the predictor: Beta and Beta squared (β and β^2) which are directly analogous to the Eta statistics., but are based on the adjusted means rather than the raw means , and provide a measure of the ability of the predictor to explain variation in the dependent variable after adjusting for the effects of all other predictors : Multiple correlation coefficient squared (unadjusted for degree of freedom) which indicates the proportion of variance explained by the whole model ;and multiple correlation coefficient squared (R^2 adjusted for degree of freedom) indicating the proportion of variance in the dependent variable explained by all predictors.

5.3.2 Results and discussions

Pursuant to the above brief description of MCA model, the full MCA table is produced using SPSS computer software (to estimate the coefficients) and Excel sheet (to calculate all the required statistics leading to the ultimate mean for every category of the independent variable). Attempt was made to select about eleven best fitting predictors and a control variable (age of respondents) based on both theoretical bases and empirical model fitting procedures. Table 5 below presents the grand mean, both adjusted and unadjusted mean number of children ever born for each predictor variable, the eta (**ή**), beta and other relevant statistics. At this juncture, it is important to indicate that the interpretation of each individual mean should basically be made as a deviation from the grand mean given at the bottom of the table.

Also, from the MCA table , it is noticed that some of the predictors are found to have relatively stronger influence on fertility while some others have weaker effects, and the rest are found to have no significant effects on the dependent variable. The relationship between some of the significant predictors (such as educational and nutritional status of respondents) and fertility is not in the expected direction.

Table 5. Results of Multiple Classification Analysis (MCA) for mean children ever born (CEB) by selected predictors and covariates, Sidama zone, SNNPRG, 2005.					
Variable	**Mean CEB**				
	N	**Unadjusted mean**	**Eta (ή)**	**Adjusted mean**	**Beta (β)**
Religion					
Orthodox Christian	72	4.10	0.095	5.74	0.**033***
Catholic	73	4.19		4.73	
Protestant	1282	4.28		4.74	
Islam	39	4.38		5.11	
Standard of Living Index (SLI)					
Low	1247	5.16	-0.05	5.61	0.011
Medium	207	5.21		4.69	
High	13	5.26		4.70	
Land size					
Landless	45	5.07	0.058	5.79	**0.036***
Less than one hectare	981	5.13		4.74	
Half to one hectare	398	5.19		4.78	
Greater than one hectare	43	5.25		5.12	
Marriage type					
Polygamous	224	6.14	-0.07	5.80	0.006
Monogamous	1234	6.10		4.68	
Number of sons wished to have					
Do not want at all	13	2.54	0.53	4.27	**0.234****
1-3	865	3.08		5.14	
4-6	567	3.61		5.37	
6+	221	4.14		5.91	
Age difference between the wife and husband					
No difference	18	5.17	0.064	5.12	**0.103****
<5 years	542	5.24		4.87	
6-10 years	632	5.30		4.98	
10+	275	5.36		5.39	
Food intake index					
Poor intake	720	5.12	0.031	6.86	-0.03
Average intake	723	5.15		4.61	
Better intake	24	5.18		5.18	
Nutritional status of respondent					
Malnourished	793	6.82	-0.094	6.29	**-0.026***
Normal	674	6.73		4.62	
Educational status of respondents					
Illiterate	1034	5.27	0.21	5.19	**0.043***
Primary (1-6)	323	4.43		5.65	
Junior secondary (7-8)	79	4.64		4.75	
Secondary (9-12)	34	4.85		4.80	
Duration of abstinence					
1-6 months	1247	5.34	0.08	5.78	**-0.034***
7-12 months	133	5.26		4.60	
More than 12 months	87	5.18		4.57	
Access to information					
Poor access	1229	5.46	-0.107	5.18	0.030
Better access	238	5.36		4.06	
Control variable (Age)	-	-	-	-	-
R = 0.81; R^2=0 .66 Grand mean = 5.34 Number of cases = 1467			*** Significant at ά .05 ** Significant at ά .01**		

To begin with, the beta (β) coefficients indicated in the last column of the table 5 tells us the level of importance or the magnitude of the contribution of the individual predictor, that is to say, the larger the value of beta (β), the greater its effect on fertility (children ever born) will be. Based on this premises, thus, the most important predictors explaining the variability in the dependent variable in order of prominence are: Number of sons a woman or preferably the couple wish to have during the course of their reproductive period, age difference between the wife and her husband, educational status of the respondent, household operational land size, duration of abstinence, religious status of the respondent, and nutritional status of the respondent. It is clearly indicated in the table above the percentage of variations in children ever born explained by the predictors as well as the covariates was 66 percent (R^2 = 0.66) and the grand mean children ever born for all the 1467 ever married women was computed as 5.34.

The fact that four of the independent variables (namely, standard of living index, marriage type, food intake, and access to information) entered into the model are not found to yield significant contribution to the variations in the dependent variable, the following few paragraphs give more emphasis only to the seven significant variables.

It is apparent from the table above (table 5) that the mean children ever born among the sample women varied significantly according to the number of sons the respondent wishes to have during the course of their life. The deviation of the adjusted mean from the grand mean increases as the number of sons wished to have increases from none to 6+. A woman who wishes to have 1-3 sons has, on an average, 0.87 children more than a woman who does not at all wish to have sons in her reproductive life. Also, a woman who wishes to have 4-6 sons during the course of her reproductive life had on the average, 0.23 children more than a woman who wishes to have 1-3 sons. Similarly, a woman who wishes to own 6^+ sons during the course of her reproductive life had on the average, 1.64 children more than a woman who wishes to have none It is also important to look at the deviation of the adjusted mean of each category of this predictor from the grand mean increasing as: -1.07, 0.2, 0.07, and 0.57 indicating that only those who wish to have no sons at all and 1-3 sons have a mean CEB below the grand mean.

Empirical studies in different parts of the world documented that sex preference has little or no effect on fertility in the pre-industrial era or in pre-transitional fertility regime mainly due to the fact that couples usually wish to have larger possible family size regardless of the sex composition of the children (i.e the larger the better principle). On the contrary, sex preference is known to have significant influence on fertility where a society is in the fertility transitional regime where there is small to intermediate family size norm. The finding in this study may not be comparable with the above premises as the variable used in this study has different orientation. Most of the conclusions drawn regarding this issue are derived from the study of birth history data while the variable employed here stands for measuring attitudinal aspect (how a couple's preference for a particular sex affects their fertility experience).

The study has included in its MCA model the age difference between the wife and husband, as it has been known since recently one of the good indicators of patriarchal family structure. The unadjusted mean of the 'no difference category' (5.17) is below the grand mean and further declined to 5.12 after adjustment was made for the effects of other variables. Though both the unadjusted and adjusted values for all the categories , except the last one, are below the grand mean , it is understood that a couple with age difference of 10^+ years may have on an average 0.27, 0.52, and 0.41children more than couple who have no age difference, <5 years difference and 6-10 years difference respectively.

Education is the third important variable in the hierarchy of contributions to the variations in the dependent variable. It is observed from the MCA table that before adjustment, the mean values for all categories of education were below the grand mean. However, the adjusted values for women in primary level of education (5.65) have shown a deviation of 0.31 from the grand mean. Thus, a woman in primary level of education on an average may have 0.46, 0.9 and 0.85 children more than a woman of no schooling, Junior Secondary and Secondary level respectively. The curvilinear pattern, in which women with few years of schooling have higher level of fertility with women with no formal schooling have been documented by many studies conducted in sub-Saharan Africa (Caldwell 1992; Cochrane, 1989; UN, 1987). In this regard, it is believed that when conscious birth control is rare, as is the case in this study population, education may increase fertility (mean CEB) by enhancing women's fecundability as a result of reduced breast-feeding and post-partum abstinence.

The nutritional status versus fertility dilemma is also tested in the MCA model. Despite lack of clear-cut theoretical and empirical evidences on the relationship between these two variables, the present analysis found out fairly negative relationship ($\beta = -0.026$) between the nutritional status of a woman and fertility. It is observed that the unadjusted mean for both the malnourished and normal women are above the grand mean, giving deviations of 1.48 and 1.39 respectively. After adjustment was made for the confounding factors, the deviation from the grand mean for the malnourished and normal women decreased to 0.29 and –0.72 respectively, showing that the adjusted mean for the normal has now become far below the grand mean. Put it other way, the adjusted mean reveals that a normal woman, on an average, has 1.67 children less than a malnourished woman.

The relationship between duration of abstinence and fertility level has been well established by several studies. In this study too, a negative relationship is found to exist between the two variables (β = -0.034). It is shown that the unadjusted mean for the women with 1-6 months abstention is exactly equal to the grand mean while the unadjusted means for the other two groups fall below the grand mean by about 0.08 and 0.16 respectively. Even after adjustment for confounding factors is made, only the 1-6 months duration group showed a positive deviation (0.44) from the grand mean Looking at the high range in the adjusted mean of the first group and the last two, it can be inferred that a woman with 1-6 months of abstention experiences 1.18 and 1.21 children more than a woman in the two categories respectively.

Though the overall duration of abstention is lower compared to some other Sub-Saharan Africa countries such as Nigeria and Kenya (as reported by Van De Walle, 1989), many women reported during the focus group discussion that they totally avoid sexual intercourse with their husband during the extended period of 4-6 months while few cases reported to have total abstention for about two years. It is learned from the focus group discussion that young women hardly have total abstention from sexual intercourse. In most of the cases, the rationale of abstinence from sexual intercourse is not considered as voluntary control of birth; rather it is a way of ensuring good health and survival of the newborn child. Fear of polluting the women's milk by having sexual intercourse during the first few months of lactation period was also reported during the focus group discussion session. This finding is consistent with large scale studies conducted in Sub-Saharan Africa by Bongaarts (1993),Cald Well (1992) and Van De Walle (1989).

Religion is the other significant variable in the MCA analysis (see table 5 above). The table revealed that the unadjusted means for all the four groups has shown a negative deviation from the grand mean (-1.24,-1.15, -1.06 and –0.96).After adjustment, however, only the mean value of the Orthodox Christian has shown a positive deviation, indicating that these group of women experience higher fertility than the other three groups. Though their adjusted mean value is below the grand mean, Muslim women also experience higher fertility compared to the Catholic and

Protestant Christian. Put it other way, an Orthodox woman experiences about 1.01, 1.0 and 0.63 children more than a Catholic Christian, Protestant Christian and Muslim woman respectively.

Under the Ethiopian context, the Orthodox Christian are known for very strong and relatively impermeable traditional belief systems and practices which strictly adheres to the Biblical order of monogamous marriage and little or no emphasis on modern contraception use to control birth. The Protestant and Catholic Christians, on the contrary, used to have liberal systems and relatively Westernized culture as these religious beliefs are also believed to diffuse from western countries .It is also seen that the Orthodox Christianity, an indigenous system of religion to the country, is impermeable to influence of Westernized culture particularly in issues of marriage, family formation, birth control and other reproductive decisions. As a result of these, it is likely to expect higher fertility among these groups of women than the other three groups. This finding is consistent with the previous findings which documented that Muslim and Orthodox Christian women, compared to Protestant and Catholic Christians, had higher number of children ever born (Assefa, 1990 and Abdulahi, 1989). However, this finding is found to be inconsistent with a study in Central Ethiopia by Betemariam (1994) which indicated that the Protestant and Muslim women experience higher fertility compared to other religious groups.

The relationship between land ownership and fertility has not been clearly set though some recent studies found a positive relationship. In this study, land (which is the main stay of the study population) was entered into the MCA model. The two variables are found to have positive relationship where the mean parity increases with increase in the size of household operational land. If we look at the adjusted mean of landless households, it is above the grand mean by 0.45 children while the adjusted deviations for the other three categories are fall short of the grand mean. While taking land ownership as a variable in studies of this type, it should be known that the value of land differs from place to place mainly depending on the type of crop grown, system of land use, population density, and other related factors. In the study area, more than 90 percent of the householders use the land for cash crop cultivation such as coffee, '*chat',* banana, sugarcane and the like which usually requires smaller plot of land than cereals. In addition to this, the most common staple food in the study area, locally known as '*Cocho',* requires very small plot of land.

VIII. Conclusion and policy implications

Based on the data collected from 1467 ever-married women and the national level data (DHS 2005) taken for comparison purpose and the analysis made using the Bongaarts fertility model, the study has shown that the high fertility experience of both the zonal and national population is generally explained by early and nearly universal marriage and extremely low rates of contraception. On the contrary, fertility of the two populations is inhibited to a great extent by cultural practices of post partum abstinence and long breast-feeding periods that led to lengthy period of lactational ammenorrhoea (PAA of 18.5 and 12 months at zonal and national level respectively). Many women use these fertility-reducing practices basically as a way of ensuring long birth intervals in order to minimize infant deaths, and as such are not considered as deliberate fertility control mechanisms. It is noted that the zonal level breast feeding effect, and hence, the inhibiting power of lactational infecundability is much higher than the national level experience (Ci= 0.54 and Ci = 0.67 with 46 % and 23 % inhibiting effect respectively).

It also implies that any reduction of the effect of post partum infecundability or shortening of the duration of breast feeding due to increased urbanization and modernization, with out reasonable increment in the inhibiting effect of other proximate determinants at the zonal level , may still maintain the high and sustained fertility. Also, certain aspects of socio-economic development have competing effects on different proximate determinants, which conceal each other out at low-level development. For example, any further progress to be made in increasing formal education in the study area help to raise the age at marriage and delaying child bearing, but small amounts of education also can break down traditional child spacing such as the prolonged breast feeding and post partum abstinence,leading to an increase in marital fertility unless compensated by substantial increase in the use of contraception. In this regard, earlier studies in Sub-Saharan Africa indicate that two months reduction from the 18.5 months of breast-feeding and post partum ammenorrhoea requires a 44 percent increase in contraceptive use (Leshaghe et'al, 1989).

The findings of the multivariate analysis using MCA model revealed that there exists significant relationship between seven explanatory variables and the dependent variable (children ever born). While Son preference, nutritional status, patriarchal structure and land size are found to have significant positive relationship with fertility, duration of abstinence is known to yield strong negative relationship with the response variable

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