

Addis Ababa University  
School of Graduate Studies

**RELATIONSHIP BETWEEN POVERTY AND FERTILITY THE  
CASE OF HOUSEHOLD OF ETHIOPIA**

**Temesgen Fitamo Bocher**



**JUNE, 2008**  
**ADDIS ABABA**

Addis Ababa University  
School of Graduate Studies

**RELATIONSHIP BETWEEN POVERTY AND FERTILITY THE  
CASE OF HOUSEHOLD OF ETHIOPIA**

**Temesgen Fitamo Bocher**

A thesis submitted to School of Graduate Studies of Addis Ababa University  
in partial fulfillment of the requirements for the degree of Master of Science  
in Economics



**JUNE, 2008  
ADDIS ABABA**

**ADDIS ABABA UNIVERSITY  
SCHOOL OF GRADUATE STUDIES**

**“Poverty and Fertility in Rural Households.”**

**By**

**Temsgen Fitamo Bocher  
Approved by the Board of Examiners:**

Muluget Demeke  
**Advisor**

Muluget D  
**Signature**

Abebech Yousif  
**Examiner**

Abebech Y  
**Signature**

Tassew Woldehanna  
**Examiner**

Tassew W  
**Signature**



## Acknowledgements

I would like to extend my deepest gratitude to my Advisor Dr. Mulat Demeke. His valuable advice enabled me to produce this work. I am delighted to thank My Sister Tsige Boltano for her close assistance throughout the work and Tekle Leza, Dawit Legasse, and Zerihun Getachaw for their valuable advice and comments. Finally, I am thankful to My Mother Abebech Oritabo for her consistent prayer. At last, but not the least, God made it all beautiful. Praise LORD JESUS.



## Table of Contents

Contents	pages
Acknowledgements-----	ii
Acronyms-----	vi
List of tables-----	vii
List of appendices-----	viii
Abstract-----	ix
CHAPTER ONE	
INTRODUCTION	
1.1 Background-----	1
1.2. Statement of the Problem-----	4
1.3. Objective of the Study-----	8
1.4. Significance of the Study-----	9
1.5. Methodology-----	10
1.6. Scope of the Study-----	11
1.7. Organization Of The Study-----	11
CHAPTER TWO	
LITRITURE REVIEW	
2.1. Definition and Concepts of Poverty-----	12
2.2. Measuring Poverty-----	13
2.3. Poverty Reduction strategies in Ethiopia-----	14
2.4. Determinants of fertility-----	15
2.4.1. Education and fertility-----	16
2.4.2. Type of place of childhood residence and fertility-----	17
2.4.3. Region of usual residence and race or population group and fertility.-----	17
2.4.4. Work status of women and fertility-----	18
2.5. Views on Economic Growth and Poverty-----	19



2.6. Empirical Literature Review-----	22
2.6.1. Population Growth and Poverty -----	25
2.6.2. Poverty and Demand for Children -----	28

CHAPTER THREE

METHODOLOGY AND DATA SOURCE

3.1. Introduction -----	33
3.2. Source of Data-----	33
3.3. Indicators and model Specification-----	35
3.3.1. Indicators of Fertility-----	35
3.3.2. Indicators of Economic status-----	35
3.3.3. Fertility Indicators and Regression Methods-----	38
3.4. Poisson Regression-----	39
3.4.1. Assumptions Used for Poisson Regression-----	39
3.4.2. Consistency of Poisson Regression-----	41
3.4.3. Asymptotic Normality of Poisson Regression-----	43
3.5. Multinomial Logit Model-----	45
3.6. Variables included in the model and their expected sign-----	46

CHAPTER FOUR

ANALYSIS OF THE DATA

4.1. Descriptive Analysis - -----	48
4.2. Econometric Analysis-----	55
4.3. Poverty Equation-----	61
4.4. Goodness of Fit-----	67

CHAPTER FIVE

Conclusions, Major findings and Policy Implications

5.1. Conclusion-----	67
5.2. Policy Implication-----	68
Reference-----	71
Appendices-----	75



## Acronyms

ASFR	Age Specific Fertility Rate
DHS	Demographic and Health Survey
FGT	Foster, Greer and Thornback
MLE	Maximum likelihood estimator
MNL	Multinomial Logit
GLE	General Linear Model
ILO	International Labor Organization
SSA	Sub Sahara Africa.
TFR	Total Fertility Rate
PASDEP	A Plan for Accelerated and Sustained Development to End Poverty
PRSP	Poverty Reduction Strategy Paper
QMLE	Quasi maximum likelihood estimator.



## List of Tables

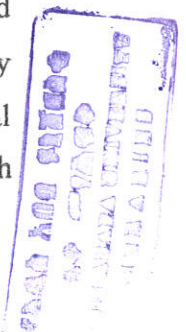
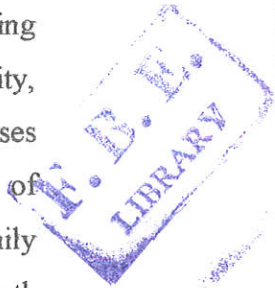
## pages

Table 4.1. Some demographic facts about Ethiopia-----	48
Table 4.2. Socio-economic differences in different regions of Ethiopia. -----	50
Table 4.3. Socio-economic differences in different rural-urban areas of Ethiopia. -----	52
Table 4.4. Poisson regression result for children ever born as dependent variable for rural sample-----	55
Table 4.5 Poisson regression result for children ever born as dependent variable for urban sample. -----	59
Table 4.6. Multinomial logit regression result for poverty equation of rural sample.----	61



## Abstract

In this study the nature and degree of the bi-causality relationship between poverty and fertility is explained. The study used data from demographic and health survey of Ethiopia of the year 2005. Poisson regression approach for multivariate analysis of fertility was employed. Fertility is analyzed by considering the number of children born to a woman with in her life time, and “asset index” was constructed from ownership of durables and housing characteristics as proxy for economic status. It was found that fertility and poverty have different relations in urban and rural areas. Strong positive relation is observed in urban areas. But it was found that poverty shows J curve causality onto fertility. Fertility is negatively related with both low income and high income levels of household; however it shows strong positive relation with middle income households. Education, age at first marriage of female, employment and contraceptives have a strong reducing impact on fertility. In addition education plays a significant role in curbing poverty by increasing the productiveness, employment opportunity and empowering women. To alleviate high fertility and poverty, one can follow to routes. First, by reducing poverty incidence through better access to education and thus employment opportunity, we can address high fertility through improved accesses for education, as it increases opportunity cost of child bearing, delay marriage, and increases awareness of contraceptive usage. The second way is, directly targeting high fertility through family planning to reduce poverty incidence. Balanced economic growth and population growth will help government to provide nations with better social service and to produce more productive generation through provision of education, better employment opportunity and improved health care service. It needs policy intervention to expand education and family planning programs with better contraceptive access to low income women in both rural and urban areas. Attention should also be given to ways of reducing social factors which encourage early marriage so as to improve the social and economic power of women.

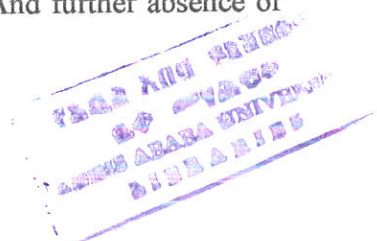


## Chapter One: Introduction

### 1.1 Background

According to MOFED report of 2007, Ethiopia the second most populous country with a population of 75.1 million in Africa is characterized by persistent poverty and socio-economic problems in which about two-third of the nation living on less than \$2 per day (Arnstein, et al, 2003), with \$180 per capita GDP. About 85% of the population are employed and based their life on primitive, rain fed agriculture. This makes the country highly susceptible for long term drought. Though, the country is on a promising progress since the past few years, and now it is on the way to transition by working towards creation of poverty free nation in 2030. In spite of all the adjustment efforts made by the government the poverty situation remained a bottle neck. The population of the country is mainly composed of youth (44%) with the growth rate of 2.79%. Hence, the population is expected to be 120 million by 2050. This population growth will erode the natural resources of the country and further worsens the current condition of the economy. That is, high population growth depletes the capital and wage, and the newly born child reduces the productivity of the mother either by taking more resource (food) or by hampering the working time and this perpetuates the vicious circle of poverty. Having zero opportunity cost for uneducated and unemployed women creates a good environment in favor of high demand for children. This goes well with the theory of child demand that states “the lower the price the higher will be the demand for children considering children as normal good”.

Studies show that 85% of the Ethiopian population is agrarian, with primitive and highly labor intensive farming technology. This confirms the existence of high demand for labor force, especially child labor. In addition, having large family is considered as success of the household head and children are believed to be old age security in rural Ethiopia. And further absence of



legal means to reward or discourage child bearing choice, lack of state benefit for small family and mechanism to penalize large families deemed as factors positively affecting fertility. For that reason, economic forces such as education, family planning service and health center distribution, social organizations and culture play a pivotal role on household decision for child demand and thus on the level of fertility.

Although factors influencing poverty/fertility pattern of the country are not constant over the past decades, developing countries have shown different progresses in their poverty and fertility levels. Some countries have witnessed a sharp fertility decline and impressive economic growth while others remained static with high fertility level, low economic growth and worse poverty conditions. Nonetheless, the issue of relationship between poverty and fertility is still debatable. It is supposed that countries with high population growth and household with large family size are expected to be poor; this assures the fact that fertility and poverty are interrelated both at macro and micro levels.

The total fertility rate (TFR)<sup>1</sup> of Ethiopia is 5.9, which is above the sub-Saharan average of 5.6. The prevalence rate of contraceptive use is low: only 8% of all married women between 15 and 49 use any method of contraception (EDHS, 2000). Though the fertility rate has been decreasing dramatically in urban areas, its decrease is slower in rural areas. According to World Bank Report (2004), with a total fertility rate (TFR) of 5.9 in 2000 the country has already achieved some progress in decreasing its past high fertility levels. Between 1990 and 2000, fertility declined on average by 0.6 births per woman and the fertility level is now comparable to the average in the SSA region. The decline in TFR in urban areas has been extremely rapid over the last 10 years, i.e., currently 3.3. Addis Ababa even displays an exceptional fertility profile by SSA standards:

---

<sup>1</sup> TFR measures the number of children born to a woman during her lifetime



its TFR is 1.95 that is comparable to the rates found in developed countries. However, the decline in rural areas has been much slower and the TFR is still at much higher rate of 6.4. Fertility is particularly high among the young residing in rural areas. As 44 percent of the total population is categorized under this age group, this indicates high incidence of expected population growth.

The fertility rate difference between the richest quintile and the poorest quintile, 6.4 and 3.9 respectively, indicate that poverty and high fertility are directly linked. And also large family households with older heads are more likely to fall into poverty than smaller households with younger heads. That is to say that addition of one more child increases the incidence of poverty.

More vividly, it is common to see children, women, men, young and old in the streets of the country's capital Addis Ababa, all looking for food, wearing dirty clothes, sleeping in open air, tackling to sustain their life through begging. No food, no shelter, no education, no medication and no family planning, but plenty of children who are going to join the same track of life style soon. These chronic situations initiate researches of this kind to identify the grass root level causes of poverty and/or fertility.

## 1.2. STATEMENT OF THE PROBLEM

Poverty has become a global issue in both developed and developing nations, it touches every part of the world; it is a central agenda of policy makers, planners and governments. Poverty can be defined in various ways. Poverty ridden people are those unable to lead a decent life (Schubert, 1994 cited in Wolday, 2001), it prohibits people from participating in activities which are believed to be a normal part of social life and makes satisfying their basic needs difficult. It is all about lack of food to consume, shelter to sleep under, clothes to cover their body, and power to make decision, poverty affects not only physical body of people but it also deteriorate the self-esteem, dignity of nations and ideology. This means poverty is pronounced deprivation in wellbeing. In some instances, it is defined in terms of not having enough to eat, a low life expectancy, high rate of infant mortality, low educational opportunity, poor drinking water, in adequate health care, unfit housing conditions.... (Wolday, 2001).

Juxtaposed to poverty scourge, today's low-income countries still have the world's highest birth rates, although women tend to have fewer children than before. The reasons for lower fertility are varied, but most are related to developing countries' economic growth and development (Soubbotina, 2004). Parents choose to have smaller families when health conditions improve because they no longer have to fear that many of their babies might die, and when they do not have to rely on their children to work on the family farm or business or to take care of them in their old age. Lower fertility rate does not immediately lead to lower birth rate and lower population growth rate if a country has a larger proportion of men and women in their reproductive years. Population growth caused by more women giving birth even though each has

the same number of or fewer children is called “population momentum.” Population momentum is particularly significant in developing countries that had the highest fertility rates.

The Ethiopian demographic structure portrays that the country has a case in point that induce it to experience ‘hidden population momentum’ that would persistently increase the population number in the coming decades despite improvements in access and use of family planning methods. A crucial mechanism, which has perpetuated poverty in Ethiopia, is this interconnection of poverty and population pressures with environmental vulnerability.

This implies that poverty doesn’t exist solely but can be revealed in terms of lack of access for socio-economic infrastructures such as lack of access to education, health care service, and better social service. However, poverty becomes severe if it is accompanied by high fertility. High fertility results in high population growth and this puts a lot of stress on ecosystem. Many factors such as food security, land tenure, environmental degradation and water supply do have strong linkage with the demographic background of the society. High population pressures and decreasing plot size (average landholdings declined from 0.5 hectares per person in the 1960s to 0.11 in 1999) together with some traditional farming practices resulted in land fragmentation rendering an increasing number of households dependent on inadequately small and unproductive plots heavily dependent on unpredictable rainfall. Households own few plots of land which is too few to leave or invest in it, leading to a progressive deterioration of their asset base. Moreover, rapid population growth may slow down the increase in per capita income; hence, it causes civil strife by increasing pressure on scarce natural resources. Most importantly, population growth affects the government programs through increased demand for education, health and other public services; when population grows too fast such investments become logistically and financially demanding.



From such inter dependency of the two, i.e., poverty and population; we understand that there is some relationship between the two variables. However, there is no common agreement on the direction of the relationship of these two variables.

There are three views in this respect. The first states that there is direct relationship between poverty and high fertility. According to this view, poverty puts people under scarcity of all necessary condition of life as a result children are believed to be the best mechanism to escape from such state of poverty and also a good old age security. In addition to this, poor people incur zero cost by giving birth to children as there is no expected loss of job; this induces higher demand for children and thus high fertility. The second view supposes that poverty and fertility are inversely related. On the one hand, it states that population as a means of production help poverty alleviation. Poverty limits parents from having more children as they have no enough to give for their children, on the other hand; and hence, their demand for additional children will decline. Lower demand for children causes lower fertility and thus poverty is best route to escape from high fertility.

The third view pronounced by Schoumaker & Tabutin (1999) comes up with the conclusion that poverty and fertility have J- curve relationship. This view argues that fertility is negatively associated with both high and low income status of households. It attempts to expound that poor are resource less including agricultural land and therefore they have less labor demand and in view of that less demand for children and lower fertility. By the same token, this view argues that fertility is negatively associated with high income and better-off household tend to have fewer children. The rationale behind is that high income families prefer to invest in quality of children and provide them with high living standards than quantity of children.

The above-mentioned different views on the poverty-fertility causality are still debatable. Putting forth the country specific direction of causality would corroborate the policy maker's decision with respect to fertility and poverty related issues. As it is a case for many other developing countries, in Ethiopia the direction of poverty-fertility causality is ambiguous.

Above all, explaining factors contributing to high fertility and chronic poverty situations in the country and how strong is the bi-causality of poverty onto fertility or vice versa need to be given due attention.

Thus, studies of this kind are highly needed at both regional and national levels. To this end, this study explains the nature and degree of poverty and fertility relationships including other socio-economic variables anticipated to affect poverty and fertility in the rural and urban areas of the country, Ethiopia. The results obtained from the study may add value to existing stock of empirical knowledge, used by policy makers; government and non-governmental organization to improve the social welfare of the society by prioritizing areas of intervention that enable the country alleviate poverty via balancing population growth with economic growth.

### 1.3. Objective of the study

The general objective of the study is to analyze the causality between poverty and fertility in Ethiopia. To make the analysis more tractable the general objective is split into the following specific objectives.

- To examine the interdependence between poverty and fertility.
- To explain the difference in poverty and fertility between rural and urban areas.
- To investigate the impact of other socio-economic and socio-cultural variables on the levels of fertility and poverty.



#### **1.4. Significance of the study**

The results of this study possibly will be used in different policy-decision making practice such as forecasting the future population trend, formulating matching policies, and designing tailored poverty reduction strategies and then working towards achieving the Millennium Development Goals (MDGs) set for the country. Moreover, this study might provide information in areas of poverty-fertility relationship and hence help the policy makers in making clued-up decisions. Above all, the study serves as a base line for other researches rallying around the topic of this research.

## 1.5. Methodology

This study elucidates the bi-causality between poverty and fertility in Ethiopia by employing both bi-variate and multivariate analysis. The data set used in this study originates from the Demographic and Health Survey of Ethiopia collected at national level between February and May 2005. The data contains information about the socio-economic and demographic characteristics of the households. It is rich in information of fertility, health, education and other related socio-economic variables. However, poverty is estimated by proxy from asset index of the household. That is, poverty status is designated by using wealth index as a surrogate variable for it. The wealth index in the data set is constructed using principal component analysis method in which property owned by the household and the housing characteristics are considered.

Fertility is explained by its intermediate determinants and economic factors contributing to its high incidence. It is measured by using the total number of children born per women in her life time known as Total Fertility Rate (TFR). To examine the causality between poverty and fertility we employed the popular Poisson regression and multinomial logit models. The Poisson regression model is used to analyze fertility-poverty causality in which fertility is deemed as a dependent variable and poverty status as one of the covariates. Alternatively, the Multinomial Logit Model is used to examine the reverse side causality, that is, poverty onto fertility where poverty is a dependent variable and fertility is one of the independent variables set to explain poverty.



## **1.6. Scope and Limitation of the study**

The study investigated the fertility - poverty causality taking into account poverty as a dependent variable and fertility as one among the independent variables such as education, age, contraceptive and employment among others, on the one hand. Fertility considered as a dependent variable and poverty as one among other independent variables on the other hand. Since the study used the national data set, the results of the study can be extrapolated to national level. Though the sample is large enough to talk about its accuracy, it doesn't tell us all about the country rather it is a good representation.

The study is multidimensional as it considers fertility, poverty and other socio-economic factors. Nonetheless, the DHS data set is not rich enough with information on poverty as there are no information on expenditure or the income of the respondents. The study attempts to solve this problem by considering wealth index as proxy and good indicator of poverty status of households. Most of all, lack of literature in the area (poverty-fertility relationship) especially for African countries precluded us from looking on the issue comprehensively.

## **1.7. ORGANIZATION OF THE STUDY**

The study organized as follows, Chapter one contains introduction, Chapter two reviews related theoretical and empirical literatures, Chapter three presents the data and methodology employed in detail, Chapter four comes up with the results obtained and chapter five concludes the findings and provides recommendations based on the analysis undertaken and the results obtained in chapter four.



## Chapter Two: Literature review

### 2.1. Definition and concepts of poverty

Even though, there is no single definition of poverty, some commonly used definitions are stated below. Poverty is state of being without the necessities of daily living, often associated with need, hard ship and lack of resources across a wide range of circumstances. For some poverty is a subjective and comparative term; for others it is moral and evaluative; scientifically established.

“Poverty is defined as relative to the standards of living in society at a specific time. People live with poverty, when they are denied an income sufficient for their material needs and when this circumstance excludes them from taking part in activities which are accepted as part of daily life in the society” (Scottish Poverty Information Unit.)

Poverty is a condition in which a person or a family do not have the means to satisfy basic needs for food, clothing, shelter, and transportation. The means include currently earned income, transfer payments, past savings, and property owned. The basic needs have many determinants, including family size age and health condition of the family members (Brue, 2005).

According to the house of common Scottish affairs, there are basically three current definition of poverty in common usage: absolute poverty, relative poverty, and social exclusion. Absolute poverty is defined as the lack of sufficient resource with which one can keep body and soul together. Relative poverty defines income or resources in relation to the average.

Poverty mainly influences the children and women its impact is significant on these groups of the community. The high poverty rate for children is especially disturbing, because poverty tends to

breed poverty. Poor children are greater risk for a range of long –term problems, including poor health and inadequate education, crime, drug use, and teenage pregnancy (Brue, 2005)

## **2.2. Measuring poverty**

There are a variety of ways used to measure the aggregate level of poverty following Foster, Greer and Thorbecke (1984); this includes additively separable class of poverty measures. These classes of measures include: a headcount ratio, which estimate the percentage of people living below a poverty threshold; a poverty gap ratio, capturing the depth of poverty; and the severity of poverty index. This different measure of poverty require different poverty reduction policies, for instance, addressing the headcount ratio will require policies different than those for addressing the poverty gap ratio or the severity of poverty index. The headcount ratio is a crude measure of poverty because it completely ignores the gaps in incomes from the poverty line and the distribution of income among the poor. The severity of poverty index has all the desirable properties of good measure of poverty.

Since this study uses demographic health survey (DHS) data for its analysis, we employ “asset index” approach to address poverty variable, in which household are divided in five strata (very poor, poor, medium, rich and very rich) based on the value of asset index.

Since poverty is multidirectional concept to address the problem, it is crucial to identify the potential source of poverty and work on the causes of poverty for a given region or country. Studies conducted on poverty both in Ethiopia and other countries, show that there is a strong relationship between poverty and fertility i.e. population growth has influence on countries welfare.

### 2.3. Poverty reduction strategies

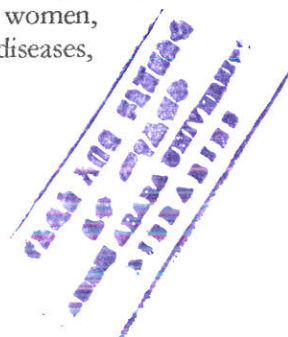
The issue of poverty has been given a great attention in both developing and developed countries; different national and international policies were formulated in different corners of the world. Some policies are in joint manner and others are country or region specific. The MDG<sup>2</sup> is among the policies formulated to deal with poverty. Peoples around the world are still struggling to escape the complexity of life under poverty conditions. different organizations were established to work on poverty reduction and creation of poverty free world, though some countries and regions succeeded in their effort and enjoying better living condition, others are still there with their severity poverty condition in the past decades and there is no promising condition to escape from poverty in the future time.

Accelerated economic growth for poverty reduction/eradication and rapid development has become very important in development literature and political pronouncements. Yet at current pace of growth, the African countries may never "make poverty history" in the next twenty years, not even to talk of meeting millennium development goals(MDG's).

Sub-Sahara Africa is one of the regions which failed to succeed in its effort to achieve poverty reduction in past decades. This is why; the United Nation put reducing poverty by half at 2015, in the first place of eight millennium development goals. So to meet this Millennium Development Goal specifically poverty reduction, different activities are taking place.

---

<sup>2</sup> MDG millennium development goal, includes eight targets, these are Eradicate extreme poverty and hunger , Achieve universal primary education ,Promote gender equality and empower women, Reduce child mortality, Improve maternal health, Combat HIV/AIDS, malaria and other diseases, Ensure environmental sustainability, Develop a global partnership for Development by 2015.



As Ethiopia is one of the sub-Saharan country which share the same economic condition with other countries in the region, like other countries it has also goes through different policy reformation and strategies. Among this, A Plan for Accelerated and Sustained Development to End Poverty (PASDEP), Poverty Reduction Strategy Paper (PRSP), to reduce poverty level. In spite of this effort the country still remain the poorest country in the world. With Life expectancy at birth of 42.3 years. More than two-thirds of the population lives on less than \$2 per day. The Ethiopian economy is agriculture-centered and in 2001, 52.3% of GDP came from agriculture and 85% of population based their lives on agriculture. The mode of production in the agricultural sector is primitive, and for this reason it is highly vulnerable to adverse weather conditions. The country has seen several severe famines in the last two decades (Arnstein et al, 2005). Though there is some progress in the general performance of the economy especially in past few years. Its sustainability is not guaranteed as it is mainly agrarian economy, which is highly vulnerable to drought and price fluctuation in the world market.

#### **2.4. Determinants of fertility**

The fertility level of any population is known to be influenced by both direct and indirect factors. The former refers to socio-economic and cultural systems including education, rural-urban residence, religion, technology, housing condition, health facilities, and social security and so on. The later are also refers as proximate determinants or intermediate fertility variables and includes proportion of married women in the population, effective contraceptive use, induced abortion, length of amenorrhea and so on. These proximate determinants have received attention due their direct impact on fertility, and consist of a set of biological and behavioral factors through which social, economic and cultural conditions can affect fertility.

As stated by freedman, “the proximate variables stand between fertility and all other preceding variables. They immediately determine fertility and all other variables act through combinations of them” (freedman, 1986). Variables affecting fertility includes education, type of place of childhood residence, region of residence ,race or population group and a woman’s work status for pay.

#### **2.4.1. Education and fertility**

The spread of education and literacy among women is believed to be a fundamental to change in reproductivity behavior. The effect of women’s education on fertility in less developed countries like Ethiopia is found to be curvilinear, that is, fertility tends to raise first with education than decrease sharply once a certain level of education is attained(Cochran,1979). The arguments is that education associated with improved health and hygiene standards which translated into lower chance of spontaneous abortion or fetal loss, lower level of infertility, abandonment of traditional constraint up on sexual behavior and practice of breastfeeding. All of which are known to raise fertility level. As educational level increases, marriage tends to be postponed which causes a negative effect on fertility and counteracts the initial effect of fertility increases. Moreover, educated women desire relatively fewer children. They have higher contraceptive prevalence and a high chance of working out side their homes. All these factors known to lower fertility levels (Cochrane 1979).However, there is also a possibility of the reverse causation which is less documented: that is, the initiation of childbearing causing the termination of education (Cochrane 1979). While analyzing the relationship between fertility and education in sub –Sahara Africa, Cochrane (1993) has shown that fertility is either curvilinear or negatively related to education but does not appear very responsive to few years of education.



According to 1998 SADHS, fertility is highest among those with no education, followed by those with primary education than those with secondary education and lowest amongst those with tertiary education.

#### **2.4.2. Type of place of childhood residence and fertility**

Generally speaking, fertility is higher for women whose childhood place of residence up to age 12 was in rural areas compared to those who grew up in urban areas. A study by Cochran (1993) demonstrated that rural fertility is substantially higher than urban fertility in every African country. The 1993 SADHS shows that TFR is 2.3 in urban areas compared to 3.9 in rural areas (DoH 1998). Higher level of education, occupation, a more modern environment and aspirations for higher level of living are among the factors that causes fertility to be lower among urban women than the rural women. Also, it is assumed that urban women have better knowledge of and access to modern contraception than rural women (Cochran 1993).

#### **2.4.3. Region of usual residence and race or population group and fertility.**

Variations in fertility have been observed in different regions or province and different race/population groups of the same country. Such variations are however the reflection of the difference or imbalances of social, economic, and cultural development, which express themselves in different level (and quality) of education, urbanization, industrialization, employment, and access to health facilities and family planning service including abortion service and so on.

The role played by industrialization and access to health facilities needs particular mention here. The influence of increasing industrialization on family and on the role of the different members in that family makes it a factor in the fertility change. Abu-Gamrah (1997) identified such indicators as land area per tractor, use of fertilizer, steel consumption, energy consumption

production of manufactured goods, consumption of cement and number of commercial vehicles as among those used to measure the level of industrialization.

Generally, it is expected that fertility is very low in societies those that have achieved radical changes in the level of industrialization and therefore the mode of production. Likewise it can be argued that fertility transactions will be completed much faster in those with high – fertility societies experiencing rapid industrialization.

As far as access to health facilities is concerned, societies with advanced health provision have also managed to bring their mortality to very low levels. Since high mortality, especially infant mortality, has been associated with high fertility, couples tend to respond to high infant loss with continued childbearing. A sharp decline in infant mortality, therefore, creates a favorable environment for family limitations.

#### **2.4.4. Work status of women and fertility**

Many studies found working women to experience lower fertility than their counterparts who are not working. For instance, the 1998 SADHS indicates that TFR for women who are working is 2.2 children per women whereas TFR for women who are not working is 3.3 children per women. 'Role conflict' theory is often advanced as the basis for differences in fertility of women who are in work-force and who are not. Working women especially those engaged in non domestic enterprise, have a conflict between work and reproduction. They find the care of children more difficult than those who are not working and hence tend to have fewer children than the later group. Even among the employed group there are substantial differentials by occupational groups. From the experience of contemporary rich nations, women who are engaged

in agricultural pursuits tend to have higher fertility than those who engaged in non- farm enterprises.

## **2.5. Views on poverty and fertility relationship**

There are two opposing views on the direction of the relation ship between poverty and fertility. These are the new view and the old controversy. Therefore, how high population growth and other related demographic variables affect and affected by poverty level is the central issue by policy makers. These different views regarding the relationship between the variables emerged, in the 1960s and 1970s. In this periods, there was strong believe that decline in fertility level would slow population growth in developing countries and thus reduce poverty. This view faced strong criticism in 1980s and 1990s. It was no longer continued. Alternative perspective emerged with idea of demographic consideration is irrelevant in poverty reduction. The rational behind this view is the concept of “human resource” population is a resource by its own right. Since, it is a primary factor of production. Nowadays, new thinking and fresh evidence challenge this view. Much of research studies show that consideration of demographic trends is indeed essential for once country sustainable economic growth. However, the potential benefit, from the decline on fertility rate depends on the timing and intensity of the demographic changes, the economic and social status of women and the type and focus of economic policy in the country.

As global economic growth has stalled, demographers and economists have been examining the role played by rapid population growth .In explaining the difference between economic condition of countries reducing fertility and those that are not. Such effort is useful to identify policies and programs that are most likely to reduce the number of people who are extremely impoverished. Both the level and the rate at which poverty has changed vary among regions. Sub-Saharan Africa, being the region with the most rapid rate of annual population growth and the lowest level

of contraceptive, appears to have shown no progress at all in reducing the level of dire poverty in the past decades. The proportion of Africans living on less than 1\$ per day did not show any change at all between the years 1987 and 1997 (Thomas W. Merrick, 2002)

Some believes that high fertility causes poverty and lowering fertility is a key factor to reduce poverty. Among this controversies are the end of 18<sup>th</sup> century. Malthus and his followers argue that high fertility and poverty went hand in hand. Malthus himself focusing on the impoverishing effect of scarce land and rising food prices urged couples not marry and have children unless they could afford to support them.

After a centuries, when population growth rate in developing countries were accelerating as result of high fertility rate and declining mortality , Malthus's successors " New Malthusian" took another track, this group argue that because high fertility create large number of children (dependents) relative to working age adults. This forces household/country to divert saving from the investment in the countries infrastructure development activities to non-developmental investment to meet the basic need of large population such as food ,health care, housing and education for growing number of children adolescents. This inhibits households and countries from investing in developmental activities, which is important to pool out their nations from persistent poverty conditions.

The dependency ratio in Ethiopia is registered to be 46 %( people age<15 and age >64), which indicates the problem of investment diversion in unintended direction and more dependent population than the working group. Because of low employment rate in the industrial and more productive sector, further worsening the economic condition of the country. This group is unskilled and less productive even to support itself rather to take care of other dependents.



However, on the other hand the other group believes that, economic policy determine poverty reduction than focusing on demographic variables. Contraception is “private good” so it is better to leave it market force rather than government intervention. From this and the above vies, we can say there is no common agreement on that expanded family planning programs (reducing fertility) would be effective in poverty reduction. Some economists argue that though, high fertility level and the proportion of peoples living under poverty line are correlated, this correlation would not imply causality, but in most studies, the relation runs in opposite direction.

Poverty could be the cause for high fertility. Poor people often wants more children because children represents wealth, provide household labor and are the only form of social security in the old age for parents. Other questions economists raise is does reduced population growth actually have a positive effects on the saving and investment. Even though the population in developing regions doubled between the years 1950s and 1985s, this had not prevented many countries in these regions from rising overall wellbeing. Thus, out come of decline in fertility depend on the policy effectiveness of the country.

## 2.6. Empirical review

Without addressing the problem of poverty, it would be difficult to talk about other economic issue, this is way all countries in the world regardless of their stage of development give poverty the foremost priority in their agenda. However, there is a great shortage of literature in the area to address the core problems of poverty.

This part of the paper will summarize few among the existing literature on the relationship between poverty and fertility. Literature on the poverty and fertility relationship didn't come up with the same or common result regarding the nature of the relation that exists among the two. So that it is possible to say, the relation is not unidirectional. Some studies approved a positive relationship between poverty and fertility, others find it to be negative, and yet others find it to have an inverse J-shaped relationship with in the poorest countries, (schoumaker, 2004).

Fertility appears higher among richer households, which is a result of low reproduction capability and general higher rates of infertility among the poor (Lipton 1998; Livi-Bacci and di Santis 1998). Studies from the 60s and the 70s pointed to such a negative relation between poverty and fertility in rural areas of Bangladesh, India, Indonesia, Pakistan and Sierra Leone. (Schoumaker, 2004)

However, the most common relationship between poverty and fertility in contemporary less developed countries is positive. This include countries with low fertility levels during the eighties and the nineties (TFR less than 3.5 – including Vietnam, Costa Rica, urban Paraguay, and urban South Africa) and with high fertility levels (TFR above 4.5, e.g. Guatemala, Cameroon, Bolivia, Calcutta in India, Belize), as well as medium level fertility (TFR between 3.5

and 4.5, e.g. Mexico, rural India, rural South Africa, Brazil, El Salvador, Ecuador, Paraguay), all show a positive relationship ( Schoumaker,2004).

Using DHS surveys from 22 sub-Saharan countries, World Bank study support a general positive relationship. There are many countries with extremely weak positive relationship between poverty and fertility. This are countries in demographic pre-transitional phases with very high TFR (e.g. Costa Rica, urban Sudan, Iran, Burkina Faso, Pakistan, urban India, rural Philippines) and this condition is also revealed during the 90s in countries with relatively low fertility (TFR less than 3.5, such as in Maurice and urban Morocco).

In some countries, such as rural areas of India and Cameroon where fertility rates are very high, the relationship takes the inverse “J shape”, implying that both low and high-income households have lower rates of fertility, whereas medium level income households have higher fertility. This is because of low income households are most likely to be landless farmers and accordingly, the demand for cheaper child labor will decline and their fertility rate too. Whereas those with the highest income has lower fertility due to higher investment in child quality i.e. quality – quantity trade off. But the middle income households have large agricultural farm and therefore have a higher demand for cheap child labor, which explains the apparent inverse J-shape (Schoumaker & Tabutin 1999). Some literature including Jalan and Ravallion (2000). using a panel from rural China focusing on the issue of transient and chronic poverty; Mculloch and Baulch (2000) using a five-year panel of 686 households from rural Pakistan showing that large reductions in poverty can be achieved through policies aiming at smoothing household incomes – simply because a large part of poverty is indeed transitory.

Dercon and Krishnan (2000) using three waves of the Ethiopian Rural Household Panel (ERHP) shows that individual consumption levels varies widely by year and season, and indicate that a much larger proportion of households are vulnerable to poverty than what cross sectional poverty statistics may suggest. Other examples of detailed analysis of poverty dynamics include Kedir and McKay (2004), using the Ethiopian Urban Household Panel (EUHP), Bigsten et al (2004) using both the ERHP and the EUHP, and Justino and Litchfield (2001) suggest that there is strong relation between poverty and fertility.

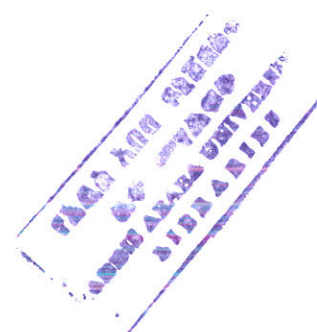
Though there is little difference between poverty in rural and urban areas (it is high everywhere) and national poverty incidence is 36.4%, there is a dramatic difference in fertility levels. It is as high as 5.5 in rural and 1.95 in capital city Addis Ababa. There are different arguments for both positive and negative relation of poverty and fertility. Those with support of positive relation, argue that slightly increases in fertility with economic status, have been usually explained by among others ,the reduced reproductive capacity of the poor (more sterility, higher fetal mortality,..), more frequent marriage dissolutions (widowhood, divorces), and more frequent and longer breastfeeding (Birdsall, 1980; Lipton, 1983). Some authors have also argued that, in some settings, the very poor also had a lower demand for children, leading to a lower fertility (Egerö, 1996). But, those supporting the negative relationships i.e. Fertility is higher among the poor – have received much more attention. The explanations for these relationships frequently rely on the idea that high fertility is an economically rational response to poverty (Lipton, 1999). In short, according to these economic approaches, the benefits of having children outweigh their costs, leading to a high demand for children and a high fertility.

Shapiro et Tambashe (2003) also observe a positive relationship between economic status and contraceptive use in Kinshasa in the early 1990s. Old-age security and the work of children are

two of the benefits frequently cited to explain the large families of the poor. These ideas are found amongst others in the Caldwell theory (Caldwell, 1982) and in the works of Birdsall (Birdsall, 1994; Birdsall and Griffin, 1988) and Cain (1981). The costs of the children of the poor are also often believed to be lower, because of the lower investment in child quality (health, education) among the poor and the externalization of costs through several mechanisms (child fostering, gender inequalities, intergenerational transfers of costs,...) (Merrick, 2001). Measuring costs and benefits of children over the parental life cycle is clearly a difficult task, especially in the African context, and it comes as no surprise that few empirical studies throw light on the question of the economic rationality of the high fertility of the poor (Stecklov, 1999). High fertility is a major contributor to poverty. Poverty and high fertility are directly linked. The TFR among the poorest quintile is 6.4 as compared to 3.9 in the richest quintile. (World Bank and MOFED, 2004).

### **2.6. 1. Population Growth and poverty**

Recent research work looked the linkage between poverty and population growth at different stage of transition from high population growth to low fertility level, one of the important findings of the study is that decline in fertility creates demographic “window of opportunity” during which personal saving and so investment is possible. High rate of fertility result in a particular age composition in which the proportion of population made up of children and teenagers is relatively larger then the share of working adults, witnessing higher age dependency ratio. As fertility rate drop the ratio of potential workers (people aged 15-64) to the non working group (people 14 or younger and 65 and older) will rises. This condition widens the age –group pyramid; indicating more active and productive generation. Further, more workers are responsible for fewer dependents. The reduction in the ratio of youth dependents to working age



adults enable countries to increase stock of physical and human capital (schools and well trained teachers, health workers and health care facilities).

However, opening “demographic window opportunity” does not guarantee a progress in economic growth. Since it is temporary and low fertility eventually will increase the proportion of old age (65 years and above), the impact of age structure on poverty reduction depends on the speed at which the transition to low fertility take place and the countries pursuing sound economic and social policies to enable larger wave of potential workers. To acquit skills and find productive employment. When countries maintain to achieve this goal like South Korea and Taiwan a temporary surge in accumulation of physical and human capital contributes to rapid raise in living standards.

Comparisons of poor countries that experienced rapid fertility decline with that smaller decline in fertility, show that high fertility increases the level of absolute poverty, both by retarding economic growth (which reduce the possibility of growth-induced poverty reduction) and by worsening the distribution of additional income created by economic growth. (Thomas W. Merrick, 2002).

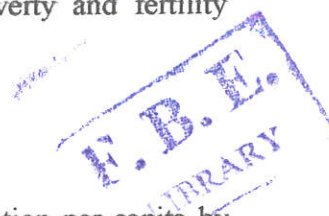
Rapid population growth has worked against the effort to reduce poverty. Ethiopia’s population growth rate during 2000-2005 was 2.44 percent per annum, compared to the sub-Sahara Africa average of 2.28 for the same period. It has a population density which is twice the average for sub-Sahara Africa. ... if the rate of population growth does not decline, it is expected that Ethiopia’s of 70 million will double with in about 25 years, affecting the saving and capital formation , and heightening the challenges of achieving the MDGs (International Development Association,2006 ).



Study published in 2003 confirmed that a strong relationship exists in Ethiopia between demographic characteristics and the probability of a household being poor. Large family households with older heads are more likely to fall into poverty than smaller households with younger heads. The addition of one more child increases the incidence of poverty. Reduction in fertility in rural areas is clearly a priority for the poverty reduction agenda (World Bank 2004).

Using panel data from four developing countries and employing random effect model (Abbi.M et al, 2004) indicates the persistence of high levels of fertility and poverty in Ethiopia. Mainly driven by lack of economic growth and poor access to family planning; education and health provision are crucial elements in reducing poverty and fertility (Abbi M. 2005).Poverty incidence in Ethiopia is 36.4 %,( MOFED, 2007). Though there is little difference between poverty in rural and urban areas (it is high everywhere), there is a dramatic difference in fertility levels. International development association agrees, the relationship between poverty and fertility indicating the causality between the two variables.

Adding one child to a household reduce rural and urban household consumption per capita by 5.9% and 17.5%, respectively. This raised rural and urban head count poverty indices by 6.1% and 19.2% respectively. (Mulat Demeke, et-al, 2003) showing that family size has a positive impact on poverty of household. This study also indicates adding one male or female adult to household will reduce rural household consumption per capita by 17.3% and raises head count poverty incidence by 18.3% and the results are statistically significant. (Mulat Demeke, et al, 2003).



Arnstein Assve et al, 2005, in their study of fertility and poverty in four countries Albania, Ethiopia, Indonesia and Vietnam, using different data sets for the four countries, come up with similar result as above in three of the four countries, this study use number of children, ratio of working men and women to see the effect of dependent, regression result show that poverty is negatively related to the proportion of working children in the household. However, households with large family size tends to be poor than household with smaller number of dependents.

### **2.6.2. Poverty and Demand for children**

A positive relationship between fertility and poverty is frequently explained in a Micro-economic framework: children are considered as an essential part of the household's work force to generate household income, and as insurance against old age. In rural underdeveloped regions, which largely rely on primitive farming technology and with no or little access to state benefits, this argument makes a great deal of sense. By acquiring children the share of household resources available for each member will decrease. Though, Children may bring more resources as they grow older through work. As such the overall net effect of childbearing on poverty is not necessarily clear cut.

However, a high number of children and their participation in household production are likely to impede investment in their human capital (i.e. education), maintaining the low-income status of the household, and thereby creating or perpetuating poverty - fertility trap. As households gain higher income and wealth, they often tend to have fewer children either through quantity-quality trade-off suggested by Becker and Lewis (1973) or by higher opportunity cost of women associated with higher income suggested by Willis (1973).

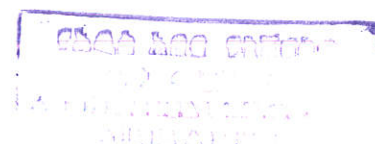
These demand side arguments rely of course on the fact that couples are able to make choices about their fertility. The crucial component in this respect regards access and take-up of family planning. Poor availability of family planning means that women will not be able to plan their fertility career very well, implying a significant amount of unintended pregnancies (Easterlin and Crimmins 1985). There is a negative (though not always strong) relationship between availability of family planning and observed fertility levels (– just as there is a negative relationship between economic growth and fertility). In other words, family planning is often more prevalent in countries that have experienced a great deal of economic progress, which is reflected by a higher contraceptive prevalence rate among households with higher human capital and wealth. In particular, women with higher earnings and high education are more likely to use modern contraceptives.

The upshot of this is that identification of supply side effects from demand side effects are difficult to establish. For instance, family planning tends to be lacking in rural areas which often rely of primitive farming technology. This is where we also observe higher fertility rates. But given their reliance on primitive farming, these households may also have higher demand for children because of access to cheap labor and old age security. This paper examines how much the theoretical frame work can be observed using Ethiopia demographic and health survey (2005).

Despite a series of economic reforms gradually being introduced in the late eighties, leading to a more mixed economy, the Ethiopian economy remains heavily agriculture-centered with around 85% of households being classified as farmers and by any measure the mode of production is primitive and labor intensive. Provision of family planning services is also poor, especially in rural areas, and by 2000 the contraceptive prevalence rate (CPR) in rural Ethiopia was only six percent, whereas it was around 45 percent in urban areas. (Abbi.k, 2005).

Ethiopia remains critically important in a heavily agricultural based economy (Admassie, 2002). Moreover, school enrolment and literacy rates, especially in rural areas, are extremely low in Ethiopia, as countries progress in their economic development, fertility rates also tends to decline, strong economic growth is often followed by a decline in the rural population (kider, 2003), Ethiopian agricultural sector and the current economic system is still characterized by state control, with very limited private ownership. Moreover, land tenure arrangements are a highly, Contentious issue in the Ethiopian agricultural sector, and there is a high level of uncertainty associated with future land redistribution. Such uncertainties may cause disincentives for Farmers' own investment in enhancing farm productivity. It is also possible that future land distribution will depend directly on family size, and in so far this is a common consensus among agricultural households, this increases the incentives for childbearing.

In the traditional micro-economic framework like Ethiopia children generate household income and thus considered as an essential part of the household's work force, as well as insurance against old age. In rural underdeveloped regions, which largely rely on primitive farming technology and with no or little access to state benefits, this argument makes a great deal of sense. Though children may bring more resources as they grow older through work, newly born children may decrease the productivity of the mother either by taking more resources (such as food) from her or hampering her work prospects. Thus deprived households, lacking essential state services and residing in highly primitive farming communities, might have higher demand for children. However, a high number of children and their participation in household production are likely to impede investment in their human capital (i.e. education), maintaining the low-income status of the household, and thereby creating or perpetuating poverty - fertility trap. As households gain higher income and wealth, they tend to have fewer children either through



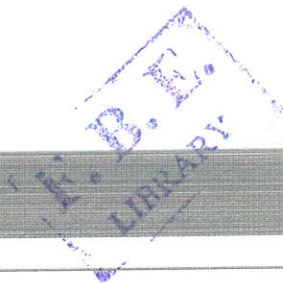
quantity-quality trade-off as suggested by Becker and Lewis (1973) or by higher opportunity cost of women associated with higher income as suggested by Willis (1973).

These demand side arguments rely of course on the fact that couples are able to make choices and to control fertility outcomes. One crucial component in this respect regards access and take-up of one crucial component in this respect regards access and take-up of family planning. Poor availability of family planning means that women are less able to plan their fertility careers, implying a significant amount of unintended pregnancies (Easterlin and Crimmins 1985). In so far family planning is not available, the power of the demand side arguments become weaker, and it becomes difficult to identify the demand side effect from supply side effects. A related issue concerns women's status and empowerment in society. Expansion of female education, thereby reducing women's willingness to give up work for childbearing, is possibly the most important driver behind increased opportunity cost and fertility decline. Consequently fertility reduction is often seen as a direct result of increased empowerment of women through education. Educational infrastructure and educational policies are clearly important as higher compulsory childhood schooling will delay the onset of a young adult's working life, thereby reducing child labour (Livi Bacci, 2000; Badeer (2001). Lack of education opportunities for women is also a factor that reinforces social norms of women's role and position in society. In many traditional and primitive societies, men's status depends very much on their ability to foster a large family and the household head is considered more successful if they have many children. Such perceptions are likely to be stronger in rural and primitive areas, where there is also stronger gender bias in terms of education (boys go to school – girls stay at home). The consequence is that women's role tend to be limited to childrearing and other household activities. With economic progress and urbanization, women gain higher education and independence and empowerment (Drovandi & Salvini, 2004). Social norms become weaker, and traditional demographic patterns fade, which is



reflected by the demographic transition. Moreover, economic progress reduces labor intensive technologies, which reduces the demand for child labor.





### 3.1. INTRODUCTION

The aim of this section is to state the sources of the data used in the analysis and to attempt an assessment of the data quality. Secondly, the methods of analysis applied to the data are described. In the assessment of the data, standard methods of checking data quality are used. The important ones are the extent of heaping of respondent's ages, the errors in reporting the number of births, birth history and the extent of imputed birth dates. An attempt is also made to assess the accuracy of data in reporting maternity history. The study used both bivariate and multivariate analysis to explore relation between poverty and fertility (population growth)

### 3.2. SOURCE OF DATA

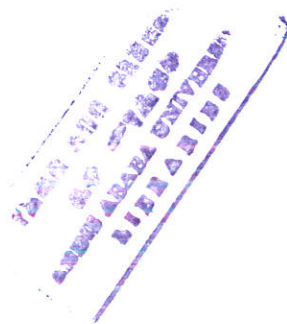
The data used in the study is obtained from demographic and Health Surveys of Ethiopia, conducted in 2005. The main objective of this DHS (demographic and Health Survey) was to collect information on fertility, family planning, education and general health. The survey was planned to provide policy maker and planners with detailed information on socio-economic condition estimates for urban and rural areas and of course for the whole country.

Three types of questionnaires were used in the survey, namely: household questionnaire, female and male questionnaires. The household questionnaire listed all usual residents of the household as well as visitors who slept in that house a night before the interview day. This questionnaire was used to collect socio-economic data as well as to identify women and men eligible for the individual interview. Basic information was collected on characteristics of each person in the household including their relationship to the head of household, age, sex, educational background, and place of residence. Socio-economic data included the source of water, type of toilet facilities, materials used for the floor and wall of the house, and ownership of various durable items like radios, television sets, refrigerators, bicycles,

motorcycles and cars. A total of 14,645 households were selected, of which 13,928 houses were occupied at the time of the interview. The household interview was completed in 13,721 households, yielding household response rate of 99 percent. A total of 14,717 eligible women were identified in this household and interview was completed for 14,070 women showing a response rate of 96 percent, for women aged between 15 and 49 years were successfully interviewed.

Similarly one into two household were selected for male survey and 6,778 eligible male were identified in this sub sample of household, of whom 6,033 were successfully interviewed, yielding a response rate of 89 percent for men(CSA, 2006). The female questionnaire was used to collect data from women 15-49 years old. Information was collected on background characteristics of a woman including reproductive history, knowledge and use of contraceptive methods, fertility preference, antenatal and delivery care. Data was also collected on sexual activities, marital status, employment status, on child survival information, breastfeeding and weaning practices, vaccinations, height, weight and the health status of children under five years. Topics like the awareness of HIV/AIDS and STDs as well as maternal mortality, female circumcision were also included. The male questionnaire had the same features as the female questionnaire except for questions on reproductive history, maternal and child health. In this study we will not deal with the male questionnaire.

The population census data will supplement the EDHS data particularly in studying fertility trends. The 1994 censuses was the major source of mortality and fertility statistics in the country since registration of births and deaths is very incomplete in Ethiopia. Usually the



questions asked during the censuses were similar to the EDHS questions with minor modifications. Therefore, the census data are expected to be comparable with the EDHS.

### **3.3. Indicators and model specification**

#### **3.3.1. Indicators of fertility**

Two approaches are used: bi-variate relationships between economic status and fertility behavior. This includes mainly general fertility, contraceptive use, and age at first marriage. Poisson regression was used to multivariate analyses of recent fertility. Economic status, proxy for poverty is the main independent variable in the multivariate analyses, and education and place of residence are the other socioeconomic variables included in the regressions. To address the problem first we compute total fertility by considering the intermediate determinant of fertility and incorporated in the poverty equation. The indicators and models used are briefly described below.

#### **3.3.2. Indicators of economic status**

In this study, economic status is measured by an “asset index”, i.e. a composite indicator constructed by aggregating data on asset ownership and housing characteristics, employing principal component analysis. Studies conducted recently with DHS data, have used such indices to measure economic status (Bollen, Glanville, *et al.*, 2001; Filmer and Pritchett, 2001; Gwatkin, Rutstein, *et al.*, 2000; Sahn and Stifel, 2000), and indicates that the relationship between economic status and fertility obtained with such asset index as proxy for poverty variables, were similar to those measured with indicators such as the expenditures per person approach (Bollen, Glanville, *et al.*, 2001; Schoumaker, 1999). The asset index approach is advantageous over income and expenditure approach in explaining the economic status of household, as income and expenditures are time variant but wealth is an indicator of long time wealth conditions.

Cartel et al. (2006) argue that income and expenditure has limitation in both accuracy and measurement. Though economists often use income to measure wealth, welfare, and other indicators of wellbeing, income data has limitations in both accuracy and measurement particularly in the context of developing countries. Where informal sector contributes significant employment opportunity with seasonal income; in this context income is not strong enough in explaining the well-being of household workers than those who receive regular payment. More over in developing countries peoples are highly engaged in barter and other non-monetary forms of trade. These indicate a high potential for error in data based on the recollection and value of all sources of income. This means that income itself does not necessarily provide a reliable measure of well-being.

Expenditures and consumption are also commonly used to measure well-being (Chen and Ravallion 2000; Ellis 2000). Since, Households can put aside some portion of their income from current to future, as times as a shield against bad times. So it is reasonable to say, expenditure solve some of the problems of income, such as seasonality. This “consumption smoothing” is both theoretically appealing and has empirical regularity.

Households also tend to be more forthcoming about expenditures, which lack the sensitivity, that some have towards exposing income data. Some of the same difficulties of income also apply to expenditure, however, such as measuring the value of bartered good. Work done for one, such as house improvement, also tends to be missing from expenditures. In addition, although economists have shown that consumption data provides more robust information on well-being than income data (particularly in rural areas), income data is still used in a number of research Studies

When household asked about their possession of certain asset list, there is less likelihood of recalling problem. Furthermore, an asset is a better indicator of long-term living standards than an income does, because they have been accumulated over time and are last longer. However, a list of assets lacks money's advantages of cardinality and fungibles. Though asset show a good picture about wealth but its construction face some difficulties. Following section explores the theoretical difficulties of creating a set of "asset" variables.

The asset index is computed as a weighted sum of a series of binary variables measuring asset ownership and housing characteristics. In this study overall, eight variables are included in the indicator (radio, television, refrigerator, motorcycle, car, finished floor, piped water and flushing toilet). Principal components analyses were used to estimate weights. This analysis transforms a set of correlated variables into a set of new independent variables known as components, which are linear transformations of the original variables (Hewett and Montgomery, 2001). The first component is retained as the asset index. Principal component analysis has been used in several recent studies using DHS data (Filmer and Pritchett, 2001; Gwatkin, Rutstein, *et al.*, 2000; Hewett and Montgomery, 2001).

Using the asset index, five categories of economic status are defined. The first category, the *poorest* women, is composed of women living in households with no assets and with rudimentary housing conditions. Overall, these women constitute almost one quarter of the women aged 15-49 in the surveys. The second category, which we call the *poorer*, live in slightly better conditions: their households possess one consumer good (usually a radio, rarely a motor cycle) and sometimes enjoy slightly better housing conditions than the poorest women. They also represent one-fifth of the women aged 15-49, the third category, which we call the *middle*, differs from the previous category mainly by better housing conditions. Most of these women live in houses with

finished floor and approximately half of them have access to piped water. None of them has consumer goods other than a radio or (rarely) a motorcycle. They represent 21% of the women in the Women in the *middle* category represent 16% of the total and possess more consumer durable goods (especially television) than women in the previous categories and also have more flushing toilets. Finally, the better off women have more televisions, refrigerators, cars and flushing toilets. They constitute a little less than 15% of the total number of women, Two other variables are included in multivariate analyses: (1) the educational level of women (no education, primary, secondary and over) and (2) the place of residence (urban, rural).

### **3.3.2 Fertility indicators and regression methods**

Fertility is measured by the total number of children ever born to women before the survey. Contraceptive use is measured by the proportion of married women using a modern contraceptive method at the time of the survey, education measured by considering the highest level of education attended; work status is obtained from question of whether she is working or not for the past twelve weeks. The mean age at first marriage among women aged 15-49 is computed using the question age of respondent at first marriage. Other variables, religion, region and ethnicity also obtained from the survey.

Total fertility rates and the effects of explanatory variables on fertility are estimated using Poisson regression (Schoumaker, 2004; Trussell and Rodriguez, 1990). An advantage of using Poisson regression to compute TFRs by economic status is that they can be based on a smaller number of cases. Another advantage of the method is that other explanatory variables (education, place of residence) can be included in the same regression model, allowing us to compare the relationship between economic status and fertility before and after controlling for other socio-economic factors.

Total fertility rate is estimated by the number of children ever born to women in her life time, but this limits the information on fertility rate for women age below 49 years as they are still giving births, therefore, the estimate is under estimate the total fertility rate. We can use other techniques to solve this problem for this purpose Bongartee index method is suitable but this study did not apply the model as there is no information regarding abortion index in our data.

### 3.4. Poisson regression

Poisson regression is one of count data model, which takes non negative positive integers. It is most widely used in studies of fertility related issues.

If  $y$  is a count variable and  $x$  is a vector of explanatory variables. We are often interested in population regression,  $E(y/x)$ ; the most forward approach is a linear model, for is  $E(y/x) = x\beta$  estimated by using OLS. For count data like number of children ever born for a woman, linear model has shortcomings similar to that of for binary response or corner solution responses. Because,  $y > 0$ . For Poisson distributed random variable and we know that  $E(y/x)$  should be a non negative for all  $x$ . if  $\hat{\beta}$  is the OLS estimator, there usually be values of  $x$  such that  $x\hat{\beta} < 0$ , so that the predicted value of  $x$  is negative

#### 3.4.1. Assumptions used for Poisson regression

The basic Poisson regression model assumes that count variable  $y$  given  $x = (x_1, \dots, x_k)$  has a Poisson distribution as in El-sayyad (1973) and maddalla (1983). The density of  $y$  given  $x$  under the poisson assumption is completely determined by the conditional mean

$$\mu(x) = E\left(\frac{y}{x}\right)$$

$$f\left(\frac{y}{x}\right) = \frac{\exp(-\mu(x))[\mu(x)]^y}{y!} \quad y = 0, 1, \dots, n \quad 3.8$$

where  $\mu(x)$  is the value of  $x$  and  $y!$  is  $y$  factorial .

We can assign a parametric model for  $\mu(x)$ , such as  $\exp(\mu(x))$  and a random sample of pairs  $\{(x_i, y_i): i=1,2,3,\dots,N\}$  on  $(x, y)$  it is straightforward to obtain the conditional MLE of the parameters.

It has long been recognized that the Poisson distributional assumption imposes restrictions on the conditional moments of  $y$  that are often violated in applications. The most important of this is equality of the conditional variance with mean.

$$\text{var}(y/x) = E(y/x) \quad 3.9$$

This assumption has been rejected in numerous applications it violates for a simple departure from a Poisson distribution. But a weaker assumption allows the variance – mean ratio to be any positive number i.e.

$$\text{var}(y/x) = \delta^2 E(y/x) \quad 3.10$$

Where  $\delta^2 > 0$  is variance – mean ratio, this assumption is used in the generalized linear models (GLM) literature, and so we will refer this assumption as poisson GLS variance assumption.

The case  $\delta^2 > 1$  is empirical relevant because it implies that the variance is greater than the mean; this situation is called Over dispersion (relative to the Poisson). On the other hand if  $\delta^2 < 1$ , when the variance is less than the mean the situation is known as under dispersion and it is the most common case. There are a plenty of count distribution in which assumption (3.10) does not hold example, NegBinII model in Cameron and Trivedi(1986). As we are interested in estimating the conditional mean parameters without specifying the conditional variance, it is Poisson regression that well suited for this purpose.  $\mu(x)$  Can take any parametric model such as  $m(x, \beta)$  for  $\mu(x)$ , where  $\beta$  is  $P \times 1$  vector of parameters the log likelihood for the  $i^{\text{th}}$  observation.

$$l_i(\beta) = y_i \log[m(x_i, \beta)] - m(x_i, \beta) \quad 3.11$$



Where we drop  $\log(y_i)$  because it does not depend on parameters  $\beta$  (for computational reasons dropping this term is a good idea. In practice, too, as  $Y!$  gets very large for ever moderate  $y!$ ). We let  $B \subset \prod^p$  denotes the parameters space, which is needed the theoretical development but practically unimportant in most cases.

The most common mean function in application is exponential:

$$m(x, \beta) = \exp(x\beta) \quad 3.12$$

Where  $x$  is  $1 \times K$  and contains unity as its first element and  $\beta$  is  $K \times 1$ , under assumption (3.12) the log likelihood is  $l(\beta) = \sum y_i x_i \beta - \exp(x_i \beta) \beta_j$ . the parameters in the model (3.12) are easy to interpret. If  $x_i$  is continuous than

$$\frac{\partial E(Y/X)}{\partial X_j} = \exp(x\beta) \beta_j \quad \text{and so}$$

$$\beta_j = \frac{\partial E(Y/X)}{\partial X_j} \cdot \frac{1}{E(Y/X)} = \frac{\partial \log[E(Y/X)]}{\partial X_j}$$

Therefore,  $100 \beta_j$  is the semi-elasticity of  $E(Y/X)$  with respect to  $x_j$ ; for small changes  $\Delta X_j$  the percentage change in  $E(Y/X)$  is  $100 \beta_j \Delta X_j$ . If we replace  $X_j$  with  $\log(X_j)$ ;  $\beta_j$  is elasticity of  $E(y/x)$  with respect to  $X_j$ . in the model the quadratic term can be included with out loss of generality, except the interpretation of the parameters

#### 3.4.2. Consistency of Poisson Regression

Once we have specified a conditional mean function, we are interested in cases where, other than the conditional mean, the Poisson distribution can be arbitrarily mis specified (Subject to regularity conditions). When  $y_i$  given  $x_i$  does not have a Poisson distribution, we call the estimator  $\hat{\beta}$  that solves 3.13

$\beta \in B$ , the Poisson quasi-maximum likelihood estimator (QMLE), we assume that for some value  $\beta_0$  in the parameter space  $B$ ,

$$E\left(\frac{y}{x}\right) = m(x, \beta_0) \quad 3.14$$

To prove consistency of the Poisson QMLE under assumption (3.12), the key is to show that  $\beta_0$  is the unique solution to

$$\max_{\beta \in B} E[\lambda_i(\beta)] \quad 3.15$$

$\beta \in B$

Then, under the regularity conditions of  $y = m(x, \beta) + v$ ,  $E(v/X) = 0$ , it follows from this the solution to equation (3.13) is weakly consistent for  $\beta_0$  (see Wooldridge, 1997c) proof that  $\beta_0$  is a solution to equation (3.15), when assumption (3.14) holds. It also follows from the general results on quasi-MLE in the linear exponential family (LEF) as stated by Gourieroux, Monfort, and Trognon (1984a). Uniqueness of  $\beta_0$  must be assumed separately, as it depends on the distribution of  $x_i$ . That is, in addition to assumption (3.14), identification of  $\beta_0$  requires some restrictions on the distribution of explanatory variables, and these depend on the nature of the regression function  $m$ . In the linear regression case, we require full rank of  $E(x_i^1 x)$ . For Poisson QMLE with an exponential regression function  $E\left(\frac{y}{x}\right)$ , it can be shown that multiple solutions to equation (3.15) exist whenever there is perfect multicollinearity in  $x_i$ , just as in the linear regression case. If we rule out perfect multicollinearity, we can usually conclude that  $\beta_0$  is identified under assumption (3.14).

It is important to remember that consistency of the Poisson QMLE does not require any additional assumptions concerning the distribution of  $y_i$  given  $x_i$ . In particular,  $\text{var}(y/x)$  can be virtually anything (subject to regularity conditions)

### 3.4.3 Asymptotic Normality of Poisson QMLE

If the Poisson QMLE is consistent for  $\beta_0$  without any assumptions beyond (3.9), why did we introduce assumptions (3.9) and (3.10)? It turns out that whether these assumptions hold determines which asymptotic variance matrix estimators and inference procedures are valid, as we now show.

The asymptotic normality of the Poisson QMLE follows from the result of

$$\sqrt{N}(\hat{\beta} - \beta_0) \xrightarrow{d} \text{normal}(0, A_0^{-1} B_0 A_0^{-1}) \quad 3.16$$

where

$$A_0 \equiv E[-H_i(\beta_0)] \quad 3.17$$

and

$$B_0 \equiv E[s_i(\beta_0) s_i(\beta_0)'] = \text{Var}[s_i(\beta_0)] \quad 3.18$$

Where we define  $A_0$  in terms of negative Hessian because the Poisson QMLE solves maximization rather than a minimization problem. Taking the gradient of equation (3.11) and transposing gives the score for observation  $i$  as

$$s_i(\beta_0) = \nabla_{\beta} m(x_i, \beta)' [y_i - m(x_i, \beta)] / m(x_i, \beta) \quad 3.19$$

It is easily seen that, under assumption (3.14),  $s_i(\beta_0)$  has a zero mean conditional on  $x_i$ . The Hessian is more complicated but, under assumption (3.14), it can be show

$$-E[H_i(\beta_0) / x_i] = \nabla_{\beta} m(x_i, \beta_0)' \nabla_{\beta} m(x_i, \beta_0) / m(x_i, \beta_0) \quad 3.20$$

Then  $A_0$  is the expected value of this expression (over the distribution of  $x_i$ ). A fully robust asymptotic variance matrix estimator for  $\hat{\beta}$  follows from

Equation,

$$\left( \sum_{i=1}^N \hat{A}_i \right)^{-1} \left( \sum_{i=1}^N \hat{s}_i \hat{s}_i' \right)^{-1} \left( \sum_{i=1}^N \hat{A}_i \right)^{-1} \quad 3.21$$

Where  $\hat{s}$  is obtained from equation (3.19) with  $\hat{\beta}$  in place of  $\beta$ , and  $\hat{A}$  is the right hand side of equation (3.20) with  $\hat{\beta}$  in place of  $\beta_0$ . This is the fully robust variance matrix estimator in the sense that it requires only assumption (3.14) and the regularity Conditions.

The asymptotic variance of  $\hat{\beta}$  simplifies under the GLM assumption (3.10). Maintaining Assumption (3.10) (where  $\delta_0^2$  now denotes the true value of  $\delta^2$ ) and defining as

$$\delta^2 = N^{-1} \sum_{i=1}^N \hat{u}_i^2 / \hat{m} = N^{-1} \sum_{i=1}^N (\hat{u}_i / \sqrt{\hat{m}}) \quad 3.22$$

The last representation shows that  $\delta_0^2$  is simply the average sum of squared weighted residuals, where the weights are the inverse of the estimated nominal standard deviations. (In the GLM literature, the weighted residuals  $\vec{u}_i = \hat{u}_i / \sqrt{\hat{m}}$  are sometimes called the Pearson residuals or standardized residuals.) In the GLM literature, a degrees-of-freedom adjustment is usually made by replacing  $N^{-1}$  with  $(N - P)^{-1}$  in equation (3.22)

Given  $\delta^2$  and  $\hat{A}$ , it is straightforward to obtain an estimate of  $A \text{var}(\hat{\beta})$  under assumption (3.10). In fact, we can write as

$$A \text{var}(\hat{\beta}) = \delta^2 \hat{A}^{-1} / N = \delta^2 \left( \sum_{i=1}^N \nabla_{\beta} \hat{m}_i' \nabla_{\beta} \hat{m}_i / \hat{m} \right)^{-1} \quad 3.23$$

Note that the matrix is always positive definite when the inverse exists, so it produces well-defined standard errors (given, as usual, by the square roots of the diagonal elements). We call these the GLM standard errors.

### 3.5 Multinomial logit model

Multinomial logit model is one of the families of multiple out come models. It is employed when there are more than two response variables which are categorical .In each case, an individual chooses one alternative from the group of choices. Let the random variable Y takes on values  $\{0, 1, \dots, J\}$  for J positive integer and let x denotes a set of conditioning variable and Y choice variable, then X can take different independent values.

We are interested in how *ceteris paribus* changes in the element of X affect the response probabilities,  $p(y = j / x) \quad j = 0, 1, \dots, J$ . since the sum of the probabilities is unity. We can determine the probability of  $p(y = 0 / x)$  once we determine the value of the probabilities for

$$j = 1, \dots, J.$$

Let x be a  $1 \times K$  vector with first element unity. The multinomial logit (MNL) model has response Probabilities.

$$p(y = j / x) = \frac{\exp(X\beta_j)}{[1 + \sum_{h=1}^J \exp(X\beta_h)]} \quad j = 1, 2, \dots, J$$

Where  $\beta_j$  is  $K \times 1$ ,  $j = 1, 2, \dots, J$ . Because the response probabilities must sum to unity

$$p(y = 0 / x) = \frac{1}{[1 + \sum_{h=1}^J \exp(X\beta_h)]}$$

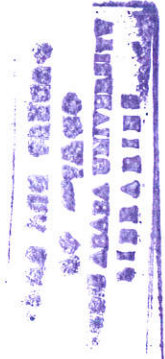
Where  $J=1$ ,  $\beta_1$  is  $K \times 1$  vector of unknown parameters, and we get the binary logit model.



The partial effects for this model are given as

$$\frac{\partial p(Y = j/x)}{\partial X_k} = p(Y = j/x) \left\{ \beta_{jk} - \left[ \sum_{h=1}^j \beta_{hk} \exp(x\beta_h) \right] / g(x, \beta) \right\}$$

Where  $\beta_{hk}$  is the  $k^{\text{th}}$  element of  $\beta_h$  and  $g(x, \beta) = 1 + \sum_{h=1}^j \exp(x\beta_h)$ .



### 3.6. Variables Included and Their Expected Signs With

#### The Dependent Variable

In Poisson regression fertility is the dependent variable. It is measured by considering the number of children born to a woman aged 15-49, accounting for the impact of marriage incidence, contraceptive use, postpartum infecundability, and index of induced abortion. The first and main independent variable is poverty level approximated by wealth index. The impact of poverty in fertility is not prior expected. Since it can have positive and negative influence on fertility but more generally we expected weak positive relation between the two variables. The second independent variable in fertility equation is education, approximated by the number of years attended. Hence the expected sign will be negative as education increases the opportunity cost of giving child, decreases early marriage, increases knowledge of contraceptive and effective usage. The third variable is place of residence. This variable will have positive effect if it is rural and negative for urban areas, and this is due to the fact that urban women have better access for education and contraceptive. But the opposite is true for rural women, so positive sign is expected, for more children per women in rural areas than urban areas. Age of household head older house head expected to have more children than the younger heads. Employment will have negative impact on the fertility level, as it increases opportunity cost.

## CHAPTER FOUR: EMPIRICAL ANALYSIS

### 4.1. DESCRIPTIVE ANALYSIS

This part explains the descriptive and econometric analysis. The country is experiencing high fertility level measured by TFR, above 5 children per woman for the past 20 years. For that reason, population growth remains high in the mentioned periods; it grows at the rate on average 2.5 per year. During the stated period life expectancy of the country's population has not shown significant change. Further more, the improvement in the growth of GDP and Proportion of urban population is still at its lower face. This implies that the efforts made to alleviate poverty are swamped by the growth of population. The very small change in percentage of rural population confirms that the majority of the population still depends on agriculture as means of livelihood. As a result the demand for labor in general and child labor in particular has become high, for the sector uses labor intensive traditional production techniques.

Table 4.1: Some demographic facts about Ethiopia

Year	1980	1990	2000	2003	2005/6
Total Fertility Rate (TFR)	6.6	6.9	5.7	5.7	5.4
Life Expectancy at Birth(year)	42.0	45.0	42.3	42.1	49
Population Growth(% annual)	2.7	3.7	2.4	2.1	2.62
Total population(in millions)	37.7	51.2	64.4	68.6	75.5
Rural population(% of total)	89.5	87.3	85.1	84.4	83.75
GDP(% annual)	-	107.3	115.1	115.1	180
Children labor ratio(%of 10-14 yrs)	46.3	43.5	41.1	40.4	

Source: *World Development Indicators* database and DHS 2005.

From the above table, one can see that that the fertility rate is high though it is declining at small pace, only 1.2 children decline per woman was observed for the past twenty five years. The policy dimension of poverty and fertility is important to balance growth of economy and population. Ethiopian population policy mainly laid on the National Population Policy of

Ethiopia (NPPE) established in 1993. One of the core problems of the country facing is that the population has been growing at a faster speed than the economy itself, and the major demographic dynamic behind this is the high fertility rate. It also voices concern over the fact there is little indication that fertility rates are about to decline.

A key element of the document is that the policy implications related to the ever growing population should not be limited to provision of health. Rather, population growth, and in particular high fertility rate, is a multifaceted issue that is both a cause and consequence of economic development and related to education, health provision, private investment, food insecurity, environmental problems, and social norms and traditions related to women's role in society. Particular weight is put on the economic, social and political status of women and its bearing on fertility levels.

In so far women's roles are defined in terms of household management and child bearing and caring duties, women even have less decision power on fertility, but the decision lies mostly on household head. Although there are no laws prohibiting women from attending school, the traditional roles of women are reflected and reinforced through a strong gender bias in school attendance. The weak role of women and its relationship to high fertility rates are exacerbated through inadequate family planning. Inefficiency in its delivery together with restrictive legislation has certainly not encouraged the use and spread of modern contraceptives. Objectives of the Ethiopian NPPE encapsulate a range of issues, including closing the gap between population growth and low economic productivity, reducing current TFR from 7.7 down to 4.0, raising the social and economic status of women and increase women's participation in education and removing legal customary practices which currently restrict women's economic and social rights.

#### 4.1.1. Socio-Economic difference in different regions of Ethiopia.

Table 4.2. Socio-Economic Pattern of some variables in different regions of the country.

Region	TFR	contraceptive rate	Age1 <sup>st</sup> marriage	% of Low income group	% of Complete secondary group	% of Urban population
TIGRAY	5.95	13.5%	14.9	35.2%	3.3%	7.9%
AFAR	6.08	2.5%	16.4	76.4%	4.2%	7.6%
AMHARA	6.14	13.3%	13.7	17.1%	2.2%	5.9%
OROMIA	6.42	12.3%	16.3	21%	3.6%	7.7%
SOMALIA	6.12	0.9%	17.4	70.5%	1.7%	16.3%
BINSHANGU	4.84	10.7%	14.6	19.1%	1.7%	7.4%
SNNP	6.38	12.6%	16.4	9.75%	3.2%	8.2%
GAMBILA	4.89	14.7%	15.4	39.4%	3.9%	15.2%
HARARI	3.46	23.6%	16.9	8.1%	19.1%	38.3%
A.ABABA	2.01	39.9%	17.8	0.27%	42.1%	94.7%
DIREDAWA	3.66	22.8%	16.4	12.9%	16.6%	57.4%

Source: - Derived from Demographic and Health Survey of Ethiopia 2005

From the above table it is clear that there is significant difference across regions regarding different socio-economic conditions. First the total fertility rate which is high for the country even compared with that of Sub - Sahara countries shows variation within regions. The highest fertility rate of 6.4 children per a woman is observed in Oromia region and the smallest in Addis Ababa City ( 2.01). This difference in fertility rate occurred in the regions due to differences in other socio-economic factors such as education, family planning, contraceptive use ...etc. Especially, significant difference is observed in contraceptive usage rate. Though contraceptive is playing crucial role in reducing the high fertility rate to the millennium development goal level of

4 children per women, its distribution still remains low in the country and confounding with other factors it resulted in the current high fertility rate of 5.9. With this pace it becomes difficult to achieve the millennium development goal set to reduce fertility. All the regions show the low contraceptive rate which is below 15%. The highest contraceptive rate, 39.9 percent, is observed in Addis Ababa as opposed to the smallest and discouraging contraceptive rate 0.9 in Somali region that is forty times less than that of Addis Ababa.

Age at first marriage of female plays a significant role in reducing the high fertility rate. Women get married at early age expected to have more children than those of joining marriage at their late age. The smallest average age at first marriage, 13.7 years with highest fertility rate 6.14 on average of Amhara region is by far different from the late marriage age of 17.8 years with fertility 2.01 in Addis Ababa. This implies that women in Amhara region get married four years ahead than women in Addis Ababa; and possibly they will give two children before that of Addis join marriage. This further confirms strong inverse relationship between age at first marriage and fertility level of a woman.

Income differences measured by wealth index differ from one region to another. The largest proportion of women with low income, 76.4% and 70.5%, are observed in Amhara and Somali regions, respectively. On the other hand, smaller proportion of women with low income 8.1% and 9.75% is found in Harrari and SNNP regions, respectively. These show high income differences across regions and fertility differences. One of the explanatory variables in describing the difference in fertility rate across regions is education. As it can be observed from table 4.2 there is a significant difference in educational attainment. The better educational attainment, 42.1 percent, is observed in Addis Ababa and the lower attainment, 1.7 percent, in Somali and Binshangul-Gumize regions. The comparison of regions above clearly indicated the relationship

between fertility and education. The high fertility rate, 6.4, with smaller educational attainment of 3.6% in Oromia region, and the smallest fertility rate, 2.01, with higher educational attainment, 42.1% observed in Addis Ababa indicates strong negative relation between fertility and education in the regions.

Urbanization is also found to be different in the regions. Region with smallest urban population, 5.9%, like Amhara has high fertility rate of 6.14 compared to regions with larger proportion of urban population such as Hararri (38.3%), with smaller fertility rate of, 5.46. This gives clue to making decision for improving urban economic conditions and increasing proportion of urban population and hence this may reduce high fertility rate in Ethiopia.

#### 4.1.2. Rural- urban differences in socio-economic variables

Table 4.3. Socio-economic variables difference in rural and urban areas

Socio-economic variables	Rural	Urban	National
Contraceptive use rate	9.7	34.22	13.85
Fertility Rate	6.2	3.8	5.98
Wealth(%of poorest and poorer)	51.78	1.91	43.33
Education(secondary & above)	0.81	33.64	6.37
Age at first marriage of female	15.59	16.59	15.75

Source: - DHS (2005).

Descriptive analysis of the data above shows some interesting facts about Ethiopian women aged 15-49. The main objective variable, fertility, shows a significant difference between the two places of residence. The highest fertility rate of rural, 6.2 and that of urban, 3.8, children per

woman has been observed. The differences explained here is similar to the differences in other related socio-economic variables.

There is a significant difference in contraceptive usage between rural and urban samples. In the rural areas the contraceptive usage rate is found to be 9.7 percent as opposed to the figure registered, 34.22 percent, for urban women which is by far large value. This result is not unexpected. Since urban women are more advantaged than the rural in most aspects of life, they have better access for education, family planning, employment and other socio-economic opportunities. This condition is found to influence the difference. On the other hand, the nationwide contraceptive rate is 13.85 percent in 2005, showing a promising improvement from that of 8 percent in 2000. This might be due to improved family planning and educational distribution.

Looking at the marriage index, it is found that more than 72 percent of women aged 15-49 are currently in union (married or living together) with varying proportion in rural and urban areas. More than 81 percent of women living in rural area age 15-49 are currently married, but 45 percent of urban women within the age interval are not in union. This smaller proportion of marriage in the urban area is mainly due to the difference in educational attainment.

The study also comes across with differences in the number of children ever born in rural and urban areas. We expect more children per woman in rural areas than in urban areas. More than 76 percent of women in urban areas have only two children or less and more than 52 percent of them have no children. But more than 73 percent of women in rural areas have five or less children. Further the study shows that low income women have two more children than high income woman. Improving the income level from low income to high income reduces the number of children born by two. The other important variable is education. Families with no or

primary education have, 6.3 children two times more than from those complete secondary and higher,3.4. Women with no education on average give birth about to seven children. But women with complete post compulsory education have three children. This difference is associated with the difference in understanding and efficient usage of family planning, delayed marriage, and better economic status between urban and rural dwellers.

More than 88 percent of women in rural areas have no education and only 0.93 have complete higher education. But on the opposite more than 33 percent of women in urban areas have complete secondary education. One more year of education reduces the probability of having children by 1.5. i.e. shifting educational attainment from lower to higher will reduce the probability of having children by 1.5. Women living in urban areas have smaller children than women in rural areas.

The other prominent variable is age at first marriage of female which is given smaller weight in policy. However, it is playing a significant role in worsening the fertility situations. On average Ethiopian women join the marriage at age of 16 years though there is difference among rural and urban areas and across regions. The smaller average age at first marriage for women is seen in Amhara region which is 13.7 years, while the highest average age at marriage of, 17.4 years, in the Somali region accounting for differences in fertility level in the two extreme cases.

## **4.2 Econometric Analysis**

Studying the fertility-poverty causality relationship differences in rural and urban areas is one of our objectives. Poisson regression is employed to study the relationship between the two variables. In this model, the number of children born to a woman is taken as dependent variable and wealth index proxy for poverty is used as independent variable with three dummies for low, middle and high income groups, education, regional, religion and ethnicity dummies also included. Poisson regression model is suitable to include other independent variables without loss of generalities. Accordingly, age of household head, education, contraceptive usage, employment, region, religion and sex of household head are incorporated in the model. The multinomial logit model is used to the poverty analysis. Poverty is represented by the wealth index constructed by using principal component analysis. Five categories of wealth are constructed as 1, 2, 3, 4, and 5 for poorest, poorer, middle, richer and richest groups. In poverty equation the main dependent variable is the wealth index proxy for poverty level. Other socio-economic variables such as education, age of household head, children ever born, family size, place of residence dummy, employment dummy, region dummy, ethnicity and religion dummy are included as explanatory variables. Separate regression result for rural and urban dwellers is presented and discussion follows.

### **4.2.1 Analysis of Fertility Determinants in Rural areas**

As it can be drawn from the fertility analysis below coefficient on age (age square) of household head is a found to be positive (negative) with fertility level of household. This indicates age of household head is positively related with fertility at early age and negatively at old age, i.e. fertility tends to increase with age of household head and than starts to decline. Using panel data to study state dependency in child bearing and fertility in rural Ethiopian (Arnsit et-al, 2003) show similar result. The above result also can be explained as age increases the probability of

getting married and giving children becomes higher to some point and then start to decline around fifties.

Age at first marriage of female has a significant reducing role on the fertility level of women in rural areas. The coefficient on age at first marriage of female is significantly negative. This implies early marriage leads to higher fertility; because, women joining marriage at her early age will have more children than those joining marriage at late age.

Women with no education tend to give more birth than those of at least primary education. No education dummy for fertility analysis appears with strong positive sign on the number of children ever born to women. The result witnesses education and fertility have strong negative relationship. This, might be because of, women with at least primary education have better understanding about the usage of contraceptive and opportunity for paid job, which reduces the incidence of giving more births.

Though, there is low level of contraceptive prevalence in the rural areas, it is found to be the most important variable in explaining the high fertility. Coefficient on contraceptive usage has a significant negative sign with the fertility level. Women using contraceptive effectively tend to have fewer children than those who are not using. This confirms that, if women are using contraceptive effectively they manage to limit their fertility level. As contraceptive reduces the tendency of unwanted births, it has shown a significant negative relationship with the fertility level of women.

Coefficient on employment dummy in the following table shows the role of employment on fertility. Negative sign reveals that there is strong negative relationship between employment and fertility. Since, work status of women plays a crucial role in determining the fertility rate of



women. We expect negative relationship between the two variables. Working women are more likely to have fewer children than those who are not working. The argument behind this is, employed women found that bearing children is difficult task. Because, bearing children becomes difficult for employed women. They might loss their jobs and share their resources with the children. The study entertains this fact. The result confirms that employment reduces probability of having children by increasing the opportunity cost of giving additional children. Thus, the better the employment access for women the lower will be the fertility.

The other important variable found to be significantly affecting fertility is income level. Fertility shows 5% significant negative relationship with both lower and higher income levels compared to positive relationship with middle income households. Similar result was found in the work of (Schoumaker & Tabutin, 1999) and (Jalan & Ravallion, 2000) on poverty dynamics for china. This Shows the presence of J relationship between poverty and fertility in rural Ethiopia. Since in rural Ethiopia the poor are most likely to be with small land holdings, which is about 0.1 hectare per capita. Accordingly, their labor demand is low and fertility rate too. Negative relationship of fertility with higher income level observed because of better - off household prefer to investment more on quality of children than quantity. However, middle income group owe more agricultural land than low income household and thus their demand for cheap labor increase and their fertility level also increases.

Christian household have fewer children than the Muslim households. The sign on coefficient of Christian dummy indicates weak negative relationship with fertility level. This implies Muslim women tend to give more births compared to Christian women. This might be, because, difference in doctrines of two religions not to avert fetus either by natural means or using contraceptive and giving more children considered as blessing. Such activities are considered as

sin and violating the commands of creator. This attitudinal difference leads to more children in community where religion leaders are also idea leaders. So that it pays more to give attention for such conflict between fertility reduction policy and religions belief to achieve lower fertility level. In communal societies, with strong religious mind, such as of Ethiopia, it needs the participation of religious or other social activity leaders, in the work of fertility reduction.

There is no significant difference regarding fertility between different ethnic groups in rural areas. Amhara and Tigray ethnic group show significant negative relationship with fertility level compared to other ethnic groups, while Oromo and Gurage ethnic group show a significant/insignificant positive relationship with fertility compared with other ethnic groups. This might be explained by differences in social, culture and economic development in the regions. Naturally, female headed household tends to have fewer children than male headed households. The study confirms this reality; female headed families are negatively related to fertility levels. In Ethiopian case, female headed families are those who lost their partners through death or other means, so such families have less probability of giving children.

Table 4.4. Poisson regression children ever had born dependent variable. Rural sample

Children ever born	Coefficient	z-value	p-value
Constant	1.022	33.89	0.000
AGEHEAD	0.03	28.12*	0.000
AGESQUAR	-0.003	-22.41*	0.000
AGEFRSTMARFEM	-0.016	-23.84*	0.000
NOEDUCD	0.23	34.11*	0.000
CONTRSPVD	-0.038	-5.33*	0.000
EMPLOYEDD	-0.035	-7.34*	0.000
LOWINCD	-0.015	-2.06**	0.102
HIGHINCD	-0.012	-2.00**	0.000
CHIRTAIND	-0.003	-0.64	0.605
AMHARAETHN	-0.017	-2.84*	0.989
GURAGEETHN	0.032	2.38**	0.003
OROMOETHN	0.006	0.99	0.249
TIGRAYETHN	-0.042	-5.13*	0.203
FEMALEHEADD	-0.003	-0.49	0.378

\*, \*\*, \*\*\* are 1%, 5% and 10% level significant, respectively.

*Number of observation=32883, log likelihood=-73901.555, prob>chi2=0.000, pseudoR2=0.75*

#### 4.2.2 Analysis of Fertility Determinants in Urban areas

It can be seen from table below, similar positive/negative relationship was observed between fertility and age/age square of household head except the degree of significance. Significance level decreases for age and increases for age square. Age square is importantly significant for urban household head confirming low number of children even at old age. This might be due to urban families managed to limit on number of children they give birth.

High income dummy shows significant negative relationship with the number of children ever born and thus with fertility. Like the rural case, better wealth (high income) associated with low fertility, statistically significant negative relationship between the two variables is observed as urban better off household prefer quality than quantity of children. However, unlike the rural household lower income in urban areas is positively related with fertility. This indicates in urban

areas poor are more likely to give more births than middle income group. But high income households have fewer children than middle income group. Since, urban poor have no wealth to invest on children and send their children to private. There is opportunity to share cost of childbearing by sending their children to public schools than private and they face less cost and their demand for child will rise. The result implies that fertility tends to decrease with wealth level.

Though, it is less significant compared with the rural case, age at first marriage plays strong role on fertility level of women. Coefficient on age at first marriage of women appears significantly negative. It is negatively associated with fertility rate, if women get married at early age she will stay long within union and thus give more birth than those who married at late age. Delaying marriage by one year will reduce the probability of giving one more children by more than 1.6 percent.

The other variable with decreased significance is contraceptive dummy compared with rural case. High fertility in urban areas can also been explained by other factors than contraceptive, since there is high rate of contraceptive in the urban areas the difference in fertility is due to difference in other factors such as education, income difference, employment type, etc.

Education dummies show negative relationship with fertility, women with primary education give fewer births than uneducated women; similarly women with secondary and above education give by far less births than those without any education. The fertility level declines as educational attainment increases. The result in table below shows that improving the education level of women from primary to secondary and above will reduce her probability of giving children by 17

percent. While educating women at least primary education will reduce the probability of giving additional children by 23 percent

No significant difference is observed regarding fertility across different ethnic groups. However, only Oromo ethnic group have positive relation with the fertility compared with other ethnic groups. Amhara, Gurage and Tigray ethnic groups show insignificant negative relationship with fertility compared with other ethnic groups.

Table 4.5. Poisson regression children ever had born dependent variable, urban sample.

Children ever born	Coefficient	z-value	p-value
Constant	1.235	18.91*	0.000
AGEHEAD	0.000	14.20*	0.000
AGESQUAR	-0.000	-11.34*	0.000
AGEFRSTMARFEM	-0.016	-11.63*	0.000
PRIMARYEDUCATIOND	-0.215	-13.72*	0.007
SECONDHIGHERD	-0.386	-21.31*	
CONTRSPDVD	-0.386	-2.59**	0.000
EMPLOYEDD	-0.038	-3.52*	0.000
LOWINCD	0.029	1.48	0.000
HIGHINCD	-0.053	-3.40*	0.000
CHIRTIAND	-0.004	-0.34	0.513
AMHARAETHN	-0.046	-3.12*	0.275
GURAGEETHN	-0.088	-4.55	0.261
OROMOETHN	-0.024	-1.56	0.017
TIGRAYETHN	-0.001	-2.57***	0.990
FEMALEHEADD	-0.001	-0.11	0.213



\*, \*\*, \*\*\* are 1%, 5% and 10% level significant, respectively.

Number of observations = 6748, Log likelihood = -16279.609, Prob > chi2 = 0.0000, Pseudo R2 = 0.79

We also apply ordinary least square (OLS) regression to oversee the mentioned difference. OLS regression shows similar result like the Poisson regression, except for the significance (see appendix). Both regressions show that age of household head and dummy for low income have significant positive relationship with the number of children in urban household while low income and contraceptive have significant negative impact in rural areas respectively. On the

contrary, low income and contraceptive have positive (negative) and significant (insignificant) role on fertility respectively in urban households. Ages at first marriage, high income dummy, education and age square have negative relation with number of children ever born to a woman both in rural and urban households. Compared with Muslim Christianity has a negative impact on fertility in both in rural and in urban areas. There is no significant difference in ethnicity regarding their fertility levels.

#### ***4.3 Poverty Equation***

Multinomial logit model is introduced for poverty equation in which five categories of wealth indices were identified. Wealth index, proxy for poverty, is used as dependent variable. Age of household head, age square, children ever born, education dummy, employment dummy, Christian dummy, ethnic group and household size are independent variables. Out comes of the data analysis indicating the relative importance of each dependent variable used to explain the probability of being in given poverty (or wealth) status. We present the estimate for only rural sample. This is, because, DHS data does not give adequate information on income status of urban households. No significant differences in wealth status have been identified in urban areas.

#### **4.3 Analysis of poverty situations**

Age and age square reveals no difference in lower and higher levels of wealth. This indicates there is no significant role played by age in alleviating poverty. However, as age increases the income of household increases but not infinity, it starts to decline with age after working age.

The sign of coefficient for children ever born has shown a significant positive at lower wealth status (high poverty), while it indicates significantly negative sign on higher wealth (richer) category. The number of children ever had born (fertility) have positive impact for probability of being poor and negative impact on the probability of being richer. This assures strong positive

relationship between fertility and poverty. Similar result was shown in the work of (Schoumaker, 2004). Employment and no education dummies have shown insignificant/significant positive sign for probability of being poor, respectively. Compared with at least primary education those who are not educated are more likely to be poor. Since, Employment improves the income level of household, especially for those who are engaged in non farm paying jobs. The positive sign of employment at lower wealth quintile is unexpected. But it might be, due to the fact that, lower employment rate in paid job in the country, especially in rural areas. If it exists, it is in agricultural sector, which might not produce additional resources for market to increase the wealth level and reduce poverty through employment originated income. No education and employment dummies have shown a significant negative/positive impact on richer household, respectively. Thus, household with complete secondary education and employed are in better wealth status than those who are uneducated and unemployed.

Number of household members has positive relationship with poverty at lower level. Household with larger families are poorer than household with smaller families. Large number household members who are less productive dependent on families' wealth (more consuming) deplete resource than smaller families. However, family size impact on poverty varies from low income to better off families. The case of larger size of household members in richer families shows positive improving role on wealth and reducing poverty. This receives attention in that richer families have capacity to make their children more productive. Even though they are large in number, they further add value on families' wealth.

Comparing the sign of coefficient on regions for lower wealth quintile (poorer) group, the probability of being poor for Afar, Amhara, Gambella, Somale and Tigry Regions is lower than that of reference Region Oromia. But the probability of being poor for household in regions of

SNNP, Binshangul-gumz, Gambella, and capital Addis Ababa is higher than for household in Oromia Regions. Comparing the richer household case, Afar, Amhara, Gambella, Somale and Tigray are less richer than Oromia Region. While, Addis Ababa, benshangul-gumz, Diredawa, Hareri and SNNP are more richer than Oromia.

Looking coefficient for ethnicity dummies in table below shows, compared with other ethnic group, Gurage ethnic are associated with lower poverty status and positively related with higher wealth status (richest). This is because this ethnic group is actively participating in business than others. Christian religion followers are poorer and less wealthy than those of Muslim religion followers, the argument behind this might be the merchandize nature of Muslims than Christians'

Female headed families are more likely to be poor than male headed families. Poverty is sever among women and children. Rural dummy appears with negative both in higher and lower income group. This implies intensity of poverty is among urban household than rural once. However, urban richer are by far in high income level when compared with those of rural.

Table 4.6. Multinomial logit model, Poverty equation

Table 4.6. Multinomial logit model, Poverty equation

Wealth index	Poorer(2)*			Richest(5)		
	coefficient	Z-value	P-value	coefficient	Z-value	P-value
Constant	-0.961	-4.26*	0.000	3.125	11.01	0.000
AGEHEAD	0.009	1.10	0.273	0.004	0.43	0.669
AGESQUAR	-0.000	-1.26	0.209	-0.000	-0.08	0.935
CHILDREN EVER BORN	0.013	6.58*	0.000	-0.011	-5.25	0.000
HOUSEHOLD SIZE	0.013	1.33	0.002	0.030	2.12**	0.000
EMPLOYEDD	0.057	1.59	0.000	0.078	7.95*	0.000
NOEDUCD	0.578	3.86*	0.000	-0.495	-8.96*	0.000
CHIRSTAIND	0.268	5.65*	0.000	-1.403	-12.48*	0.000
ADDIS ABABA	1.16	2.56**	0.011	3.423	8.07*	0.000
AFAR	-1.840	-16.68*	0.000	-1.715	-11.05*	0.000
AMHARA	-0.186	-1.81***	0.000	-1.392	-12.31*	0.000
BENSHANGUL-GUMZ	0.398	4.27*	0.000	0.171	1.51	0.132
DIRDAWA	0.023	0.24	0.814	1.299	11.56*	0.000
GAMBELA	-0.798	-7.50 *	0.000	-0.523	-4.36*	0.000
HARARI	-0.105	-0.84	0.404	2.225	19.41*	0.000
SNNP	0.932	9.59*	0.000	1.375	12.55*	0.000
SOMALE	-1.439	-13.98*	0.000	-2.329	-15.26*	0.000
TIGRAYD	-0.806	-4.47*	0.000	-3.056	-11.99*	0.000
AMHARAETHN	0.802	8.92 *	0.000	2.210	21.71*	0.000
GURAGEETHN	-0.359	-2.17**	0.000	2.662	14.19*	0.000
OROMOETHN	0.506	6.24 *	0.000	1.049	11.00*	0.000
TIGRAYETHN	0.733	4.28*	0.000	2.003	8.12*	0.000
RURALD	-1.151	-8.24*	0.000	-5.738	-47.61*	0.000
FEMALEHEADD	0.161	3.78*	0.000	-0.556	-9.75*	0.000

Poorer (2)\* poorest is drop as it is insignificant compared with others.

Number of observations = 39881, Prob > chi2 = 0.0000, Log likelihood = -45144.969,  
Pseudo R2 = 0.75

Multinomial logit model is supported with OLS, to testify the sign of independent variables (see appendix). The OLS result shows some importantly different results for rural and urban samples. Similar to fertility equation number of children ever born has significant positive(negative) impact, showing positive(negative) relationship between fertility and poverty in urban(rural) areas respectively. The impact of children on poverty level decline as wealth level increases; it has more impact with poorest group and low in highest income level. Children under five years have a weak negative relation with household's poverty in rural area and strong positive

relationship with poverty in urban areas. Household size also witnessed negative relationship in rural areas and positive in urban areas.

Age of household head has a positive coefficient while age square has negative coefficient, revealing when age gets higher a person becomes more active till the mid-fifties and becomes less productive at old age shift from production to consumption.

Children ever born has got a negative coefficient signifying women with more children are more likely to be poor than women with less children. Table 4.3 shows that rural women are four times poorer than the urban women. There is interesting result regarding the education level. Education pertain strong negative relation with poverty. The lower the educational attainments, the higher will be poverty incidence. Uneducated are poorer. The impact of education in reducing poverty is high for low income group. This is not unexpected as education improves productivity and creates opportunity for paid job.

As expected, employment has a positive impact in improving the income level of women. Like education, employment has a great impact on low income group to ease poverty. Women with complete post compulsory school are better in wealth than women with no or lower education. Completion of higher education has the most pronounced influence in improving wealth of a woman.



#### **4.4. Goodness of fit test**

The models that we used show strong explanatory power on dependent variables. The Poisson regression model used to analysis fertility is found to be more than 70% fit in both rural and urban samples; the calculated values of chi-square are large enough to show the goodness of the models. This indicates the explanatory variables explain at least seventy percent of differences in the fertility. Similarly the multinomial logit model shows seventy percent fit to explain the poverty situations in the analysis and the calculated chi-square values are large enough. We also test multi collinearty problem in our variables by using coefficient matrix (see appendix 4) the result confirms that there is no strong multi collinearty in the variables.

## **Chapter Five: Conclusions, Major findings and policy Implications**

### **5.1 Conclusions**

From the study we conclude that the country with low per capita-income is still experiencing substantial high fertility together with persistent high poverty levels. Many confounding factors are contributing to high fertility and poverty. This includes poor employment opportunities, low contraceptive prevalence rate (only 13 percent), low human capital and poor education infrastructure, and ill-suited social norms associated with women's role in society. Among others, women are deprived of economic and social power to make decisions while men are mighty to decide on what they consider right. This compelled couples to give birth with a decision made by the husband as he can be considered as successful if he manages large family having many children; and women are expected to specialize in household chores and rearing of children.

In so far as, this is the case in point with social norms potentially important in explaining both high fertility and high poverty.

Thus the study concludes that poverty-fertility relations differ from rural to urban areas and also within income groups. Fertility and poverty have significant positive relations in urban areas especially with low income groups. This justifies that fertility further worsens the poverty situation in urban areas.

Poverty shows a J curve relationship with fertility in rural areas. That is, fertility is negatively related with both low income and high income. This indicates weak causality from poverty onto fertility; poverty may not necessarily lead to higher fertility.

Moreover, the study concludes that educational attainment plays a significant role in reducing both high fertility and poverty. Education empowers women with, better access for employment; improve knowledge of contraceptive and the women's role in the communities. As can be observed on the previous chapter both fertility and poverty have demonstrated negative relationship with education. Fertility is higher among women those who are uneducated and in low economic situation but it is found to be lower among women educated and have better economic status. Where as significant positive relation is observed between educational attainment and wealth status. This asserts that education and fertility are found to be the most important variables which need at most attention to alleviate poverty incidence. And further, it is noted that contraceptive plays a great role in reducing high fertility; however, its prevalence is at lower rate.

## **5.2 Major findings**

The major findings of the study includes

- Poverty shows a J curve relationship onto fertility in rural areas. That is, fertility is negatively related with both low income and high income
- Poverty weakly explains difference in fertility level in rural areas but positively associated with fertility in urban areas.
- Education, employment and contraceptive play a crucial role to reduce high fertility.
- Education has dual benefit in reducing both high fertility and poverty.

### 5.3 Recommendations

To address the problem of high fertility and provide nations with better living conditions it is essential to give attention to factors that reduce fertility level of women. As far as this study is concerned there is strong positive relationship between fertility and poverty in urban areas. Therefore, policies concerning population issues should consider these facts. However, the impact of poverty on fertility is weak, i.e. the poor might not necessary have more children. But high fertility will result in high poverty situation especially in urban areas.

As education plays a pivotal role on both fertility and poverty reduction for low income group than high income ones, policymakers should focus on provision of at least primary education in such way that it help the poor to improve their awareness on poverty fertility relations.

The second factor to be addressed in public policies is family planning program. Improving effective contraceptive distribution and accesses so as to avert population explosion and hence ameliorate poverty situation of women through creation of employment opportunities must be given priority attention.

Fertility has also shown difference in rural and urban areas. Since very low contraceptive use rate, low education and meager employment opportunities are observed in rural areas, this creates a good ground for higher fertility and poverty. Tailored Policy should be designed to make deprived, poor and uneducated women better-off.

Lastly but not least, both government and non-government organizations should exert concerted efforts towards plummeting social factors contributing to early marriage, especially in rural areas.

## Reference

- Abu-Ganrah H(1977) Analytical fram work for studies of socio-economic determinants of Fertility. Technical papers, R/55, The American University in Cairo.
- Admassie, A., (2002), Explaining the High Incidence of Child Labour in Sub-Saharan Africa, *African Development Review*, **14**(2), 251 – 275.
- Arnstein et al, (2005), Poverty and Fertility in Less Developed Countries: A Comparative Analysis, Institute for Social and Economic Research, University of Essex.
- Arnstein Aassve, Abbi M. Kedir, Habtu Tadesse Woldegebriel. State dependence and causal feedback of poverty and fertility in Ethiopia. Working Paper No. 06/7, June 2006.
- Becker, G. and Lewis H.G., (1973), On the Interaction between the Quantity and Quality of Children, *Journal of Political Economy*, **81**(2), Part 2, S279-S288.
- Bigsten, A., B. Kebede, and A. Shimeles, (2003), "Growth and Poverty Reduction in Ethiopia: Evidence from household Panel Surveys", *World Development*.
- Birdsall, N., 1983, "Population and Poverty in the Developing World". World Bank Staff Working Paper, 404, Washington D.C The World Bank.
- Birdsall, N.M. and Griffin, C.C. (1988), Fertility and Poverty in Developing Countries, *Journal of Policy Modeling*, **10**(1), 29-55.
- Brue, R.Mc, 2005 microeconomics, McGraw – Hill companies, inc, New York
- Bollen, K., J. Glanville and G. Stecklov, 2001, "Economic status proxies in studies of fertility in developing countries: does the measure matter?" *Measure Evaluation Working Paper*, 01- 38, Chapel Hill: Carolina Population Center.
- Cain, M., 1981, "Risk and insurance: perspectives on fertility and agrarian change in India and Bangladesh", *Population and Development Review*, **7**(3), pp. 435-474.



Caldwell, J., 1982, *Theory of Fertility Decline*. London, Academic Press.

Cochrane SH(1979) *Fertility and Education: what do we really know?*

World Bank staff Occasional paper, No. 26

Chen, S. and M. Ravallion, 2000, "How did the world's poorest fare in the 1990s?"

Too little economic growth & persistent inequalities: reasons for the disappointing rates of poverty reduction?" Washington D.C.: The World Bank.

Cohen B (1993) *Fertility levels, differentials, and trends*. In KA Foote, KH Hill & LG Martin (Eds) *Demographic changes in Sub-Sahara Africa*, Washington DC:National Academy press.

CSA. *Demographic and Health Survey of Ethiopia*. 2000, Addis Ababa, Ethiopia.

CSA. *Demographic and Health Survey of Ethiopia*. 2005. Addis Ababa, Ethiopia.

Dercon, S. and Krishnan, P., (2000), *Vulnerability, Seasonality and Poverty in Ethiopia*, *Journal of Development Studies*, 36(6).

DoH(department of health, south Africa)(1998) *south Africa Demographic and health survey Preliminary report*, Pretoria.

Easterlin, R.A., and Crimmins, E.M., (1985). *The Fertility Revolution*, University of Chicago press.

El Sayyad, G. M. (1973), "Bayesian and Classical Analysis of Poisson Regression," *Journal of the Royal Statistical Society, Series B*, 35, 445–451

Egerö, B., 1996, "Poverty and fertility: reproductive change under persistent poverty", *Yearbook of population research in Finland*, 33, pp.218-242.

Filmer, D. and L. Pritchett, 2001, "Estimating wealth effects without expenditure data – or tears: an application to educational enrollments in states of India", *Demography*



38(1), pp. 115-132

Freedman R (1986) Fertility determinants, London: Oxford University Press.

Foster, J., Greer, J. and Thorbecke, E., (1984), A Class of Decomposable Poverty Measures, *Econometrica*, 52(3), 761-766.

Gwatkin, D., S. Rutstein, K. Johnson, R. Pande and A. Wagstaff, 2000, "Socio-economic differences in health, nutrition and population". Washington D.C.: The World Bank.

Hewett, P. and M. Montgomery, 2001, "Poverty and public services in developing-country Cities". *Policy Research Division Working Paper, 154*, New York: The Population Council.

Holger Seebens, 2005, *Bargaining over Fertility in Rural Ethiopia*\_ University of Goettingen and Center for Development Research, Bonn

Jalan, J. and Ravallion, M. (2000), Is transient poverty different? Evidence for rural China, *Journal of Development Studies*, Vol.: 36(6)

Justino, P. and J. Litchfield, (2003), "Welfare in Vietnam during the 1990s: Poverty, Inequality and Poverty Dynamics, PRUS working paper No. 8.

Kedir, A. and McKay, A. (2004), *Chronic Poverty in Urban Ethiopia: Panel Data Evidence*, mimeo, University of Leicester, UK.

Lipton, M., 1998, *Successes in Anti Poverty*, International Labor Organization, Geneva.

Lipton, M., 1983, "Demography and Poverty". World Bank Staff Working Paper, 623, Washington D.C: The World Bank.

Lipton. M 1999, "Population and poverty: how do they interact?" in M. Livi-Bacci and G. De Santis(eds.), *Population and poverty in developing Countries*. Oxford: Oxford University Press, pp. 25-48.

- Livi-Bacci, M. and de Santis, G., (1998), *Population and Poverty in the Developing World*, Clarendon Press, Oxford.
- Maddala, G. S. (1983), *Limited Dependent and Qualitative Variables in Econometrics*. Cambridge: Cambridge University Press.
- Mcculloch, N. and Baulch, B., (2000), Stimulating the impact of policy Upon chronic and transitory poverty in rural Pakistan, *Journal of Development Studies*, 36(6)
- Merrick, T., 2001, "Population and poverty in households: a review of reviews", in N. Birdsall, A. Kelley and S. Sinding (eds.), *Population Matters: Demographic Change, Economic Growth and Poverty in the Developing World*. New York: Oxford University Press.
- Ministry of Finance and Economic Development (MOFED) and United Nations Country Team, 2004, *Millennium Development Goals Report: Challenges and Prospects for Ethiopia*. Addis Ababa
- Mulate D. et al, 2003. *Growth, Employment, Poverty and policy in Ethiopia*. MOFED, Addis Ababa, Ethiopia.
- Shapiro, D. and B. O. Tambashe, 2003, *Kinshasa in transition. Women's Education, employment, and fertility*. Chicago, Chicago University.
- Schoumaker, B., (2004), *Poverty and Fertility in Sub-Saharan Africa: Evidence from 25 Countries*, paper presented at the Population Association of America Meeting, Boston.
- 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, University Catholique de Louvain.

Singh, S., J. Casterline and J. Cleland, 1985, "The proximate determinants of fertility: Sub national variations", *Population Studies*, 39, pp. 113-135.

Stecklov, G., 1999, "Evaluating the economic returns to childbearing in Côte d'Ivoire", *Population Studies*, 53(1), pp. 1-17.

Thomas W. Merrick, *Population and Poverty: New Views on an Old Controversy*, Vol. 28, No. 1. (Mar. 2002), pp. 41-46, *International Family Planning Perspectives*.

Trussell, J. and G. Rodriguez, 1990, "Heterogeneity in demographic research", in J. Adams, D. Lam, A. Hermalin and P. Smouse(eds.), *Convergent Issues in Genetics and Demography*. New York: Oxford University Press, pp. 111-132.

Willis, R.J., (1973), A New Approach to the Economic Theory of Fertility Behavior, *Journal of Political Economy*, 81(2), part 2, S14-S64

Wolday Amha (2001), *Addressing Poverty in Ethiopia: Concepts, Measurements, and Challenges. Training Manual*, Addis Ababa.

World Bank Africa Region Human Development & Ministry of Health Ethiopia  
2004, *A Country Status Report on Health and Poverty*, Addis Ababa, Ethiopia.

Wooldridge J.M., 2000, *Econometric Analysis of Cross Section and Panel Data*  
The MIT Press, Cambridge, Massachusetts. London, England



*Appendix 1:-Ordinary least square method for children ever born, rural sample*

Source	SS	df	MS	Number of obs = 32885
				F( 14, 32870) = 254.85
Model	24140.7921	14	1724.34229	Prob > F = 0.0000
Residual	222398.381	32870	6.76599881	R-squared = 0.0979
				Adj R-squared = 0.0975
Total	246539.173	32884	7.49723796	Root MSE = 2.6012

childborn	Coef.	Std. Err.	T	P> t	[95% Conf. Interval]
Constant	1.784	0.182	9.81	0.000	1.428 2.141
Age head	.1806088	.006941	26.02	0.000	.1670032 .1942143
Age square	-.0014837	.0000733	-20.24	0.000	-.0016275 -.00134
Age marige	-.0947042	.0042031	-22.53	0.000	-.1029424 -.086466
NoeducatonD	1.275064	.0400505	31.84	0.000	1.196564 1.353565
ContractpveD	-.2207145	.0446329	-4.95	0.000	-.3081965 -.1332324
EmployedD	-.2135144	.0309254	-6.90	0.000	-.2741293 -.1528996
LowincmeD	-.0877665	.0473143	-1.85	0.064	-.1805042 .0049713
HighincD	-.0715377	.0387112	-1.85	0.065	-.147413 .0043376
ChirstainD	-.0375285	.0323921	-1.16	0.247	-.0259612 .1010182
AmharaethnD	-.1217597	.0395835	-3.08	0.002	-.1993447 -.0441746
GurageethnD	.1368936	.0898128	1.52	0.127	-.0391428 .31293
Oromoethnd	.0660574	.0368948	1.79	0.073	-.0062577 .1383725
TigrayethnD	-.3023995	.0526425	-5.74	0.000	-.4055808 -.1992183
FemaleheadD	-.0671918	.0387674	-1.73	0.083	-.0087937 .1431773

*Appendix 2:-Ordinary least square method for children ever born, urban sample*

Source	SS	df	MS	Number of obs = 6746
				F(15, 6730) = 84.30
Model	8769.55132	15	584.636755	Prob > F = 0.0000
Residual	46672.4524	6730	6.9349855	R-squared = 0.71582
				Adj R-squared = 0.71563
Total	55442.0037	6745	8.21971886	Root MSE = 2.6334

childborn	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
_cons	3.166572	.387794	8.17	0.000	2.406371 3.926773
agehead	.1869831	.0145852	12.82	0.000	.1583914 .2155748
agesqr	-.0015034	.0001507	-9.98	0.000	-.0017988 -.001208
agefrstmar	-.0888905	.0084217	-10.55	0.000	-.1053997 -.0723812
primaryurban	-1.198028	.0931688	-12.86	0.000	-1.380668 -1.015388
sechighrur~n	-1.934731	.1004672	-19.26	0.000	-2.131679 -1.737784
contrsptD	-.1846151	.0828057	-2.23	0.026	-.3469406 -.0222896
employd	-.2190078	.0675674	-3.24	0.001	-.3514612 -.0865543
lowincd	.2069106	.1299829	1.59	0.111	-.047897 .4617182
highincd	-.3327844	.1031888	-3.23	0.001	-.5350672 -.1305017
chrstainD	-.0215508	.0784071	-0.27	0.783	-.1752536 .1321519
amharaetn	-.2772238	.094405	-2.94	0.003	-.4622876 -.09216
gurageethnic	-.5275397	.1217127	-4.33	0.000	-.7661351 -.2889444
oromoethnic	-.1663344	.099828	-1.67	0.096	-.3620289 .0293601
tigryethnic	-.33786	.135856	-2.49	0.013	-.6041807 -.0715392
femaleheaded	-.0049678	.0674429	-0.07	0.941	-.1371772 .1272417

**Appendix 3 Multinomial logit regression model for poverty determinants  
(1poorest,2 poorer, 3 middle ,4 richer,and 5,richest )**

wealthindex	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
2					
Age head	.0088981	.0081126	1.10	0.273	-.0070024 .0247985
Age square	-.0001074	.0000855	-1.26	0.209	-.0002749 .0000601
Childrenborn	.0130702	.0072666	1.80	0.072	-.001172 .0273124
HHsize	-.0117401	.0088174	-1.33	0.183	-.0290219 .0055416
EmployedD	.0570438	.03593	1.59	0.112	-.0133777 .1274654
NoeducationD	-.0089154	.04812	-0.19	0.853	-.1032289 .0853981
ChristianD	.2685929	.0475124	5.65	0.000	.1754704 .3617155
Addisababa	1.169809	.4572274	2.56	0.011	.2736593 2.065958
Afar	-1.840172	.1103046	-16.68	0.000	-2.056365 -1.623979
Amhara	-.1860166	.1025133	-1.81	0.070	-.386939 .0149058
Benshangul	.3977424	.0930638	4.27	0.000	.2153408 .580144
Diredawa	.0237599	.1007419	0.24	0.814	-.1736905 .2212104
Gambella	-.7982745	.1064469	-7.50	0.000	-1.006907 -.5896423
Harari	-.1053897	.1262109	-0.84	0.404	-.3527585 .1419791
SNNP	.9321389	.0972418	9.59	0.000	.7415485 1.122729
Somale	-1.439521	.1029543	-13.98	0.000	-1.641308 -1.237735
Tigray	-.8062949	.1802587	-4.47	0.000	-1.159595 -.4529944
Amharaethn	.8023804	.090035	8.91	0.000	.625915 .9788458
Gurageethn	.777249	.1937158	4.01	0.000	.3975729 1.156925
Oromoethn	.5062162	.0811387	6.24	0.000	.3471873 .6652452
Tigratethn	.7330453	.171301	4.28	0.000	.3973014 1.068789
Femalehead	-.0320404	.0422155	-0.76	0.448	-.1147813 .0507004
RuralD	-1.151098	.1396322	-8.24	0.000	-1.424772 -.8774237
Constant	.4698115	.250459	1.88	0.061	-.0210791 .960702
3					

Age head	.0126311	.0085528	1.48	0.140	-.004132	.0293942
Age square	-.000126	.0000898	-1.41	0.159	-.0003025	.0000496
Childrenborn	.01477	.0076401	1.93	0.053	-.0001964	.0297521
HHsize	-.007	.009235	-0.82	0.415	-.0256296	.010571
EmployedD	.053	.0376165	1.43	0.153	-.019916	.1275378
NoeducationD	-.097	.0496109	-1.97	0.049	-.1948287	-.0003576
ChirstianD	.567	.0488927	11.60	0.000	.4714455	.6631015
Addis Ababa	.431	.4858875	0.89	0.375	-.5210957	1.383548
Afar	-1.891	.1239547	-15.26	0.000	-2.134524	-1.63
Amhara	-7.93	.1027493	-7.73	0.000	-.9953558	-.59258
Benshangul	.658	.0938185	7.02	0.000	.4744013	.8421
Diredawa	-3.59	.1201003	-3.00	0.003	-.5952054	-.1221
Gambella	-1.12	.1172431	-9.57	0.000	-1.352132	-.892
Harari	.82	.1122282	7.39	0.000	.6098729	1.047
SNNP	1.31	.099955	13.18	0.000	1.121704	1.513
Somale	-2.01	.1313574	-15.47	0.000	-2.289306	-1.7743
Tigray	-2.1	.2190102	-9.61	0.000	-2.534278	-1.675
Amharaethn	1.66	.0908049	18.33	0.000	1.486857	1.84
Gurageethn	1.38	.1858625	7.43	0.000	1.016244	1.744811
Oromoethn	.696	.0859228	8.11	0.000	.5281414	.8649527
Tigratethn	1.94	.2119946	9.19	0.000	1.531714	2.362717
Femalehead	-.38	.0474097	-8.18	0.000	-.4809383	-.2950956
RuralD	-2.05	.1336127	-15.37	0.000	-2.315261	-1.791509
Constant	.8175	.2564186	3.19	0.001	.3150101	1.320152

4

Age head	.0106717	.0087019	1.23	0.220	-.0063837	.0277271
Age square	-.0001071	.0000915	-1.17	0.242	-.0002864	.0000723
Childrenborn	.0169944	.0077463	2.19	0.028	.0018119	.032177
HHsize	-.0026402	.009295	-0.28	0.776	-.020858	.0155777
EmployedD	.0611784	.0381221	1.60	0.109	-.0135395	.1358963
NoeducationD	-.2985934	.0485584	-6.15	0.000	-.3937662	-.2034206
ChristianD	.789778	.0495287	15.95	0.000	.692704	.8868529

Addis Ababa	.706749	.4650369	1.52	0.129	-.2047066	1.618204
Afar	-1.936	.1449423	-13.37	0.000	-2.222682	-1.654518
Amhara	-.357063	.1030621	-3.45	0.001	-.5577043	-.1537083
Benshangul	.745502	.0957526	7.75	0.000	.5548785	.9302218
Diredawa	-.101151	.1413462	-5.73	0.000	-1.087149	-.5330817
Gambella	-.227829	.1071734	-2.13	0.034	-.437885	-.0177729
Harari	.300475	.1073258	12.12	0.000	1.09012	1.510829
SNNP	1.830873	.1005466	18.21	0.000	1.633805	2.02794
Somale	-1.623272	.1320642	-12.29	0.000	-1.882113	-1.364431
Tigray	-1.61883	.2199919	-7.36	0.000	-2.050007	-1.187654
Amharaethn	1.874477	.0923896	20.29	0.000	1.693397	2.055558
Gurageethn	1.949683	.1812804	10.76	0.000	1.59438	2.304986
Oromoethn	1.250307	.0862687	14.49	0.000	1.081224	1.419391
Tigratethn	1.243858	.2156559	5.77	0.000	.8211806	1.666536
Femalehead	-.4715164	.0485743	-9.71	0.000	-.5667203	-.3763125
RuralD	-3.033792	.1240673	-24.45	0.000	-3.276959	-2.790624
Constant	1.293308	.2543462	5.08	0.000	.7947988	1.791818
5						
Age head	.0043385	.0101369	0.43	0.669	-.0155295	.0242065
Age square	-8.66e-06	.0001058	-0.08	0.935	-.0002161	.0001987
Childrenborn	.0221052	.0090847	2.43	0.015	.0042995	.0399108
HHsize	.0228939	.0107769	2.12	0.034	.0017716	.0440162
EmployedD	.0776807	.0449082	1.73	0.084	-.0103378	.1656992
NoeducationD	-.4950952	.0552855	-8.96	0.000	-.6034528	-.3867376
ChirstianD	1.402967	.0624141	22.48	0.000	1.280638	1.525296
Addis Ababa	3.42273	.4243597	8.07	0.000	2.591	4.25446
Afar	-1.715296	.1552364	-11.05	0.000	-2.019554	-1.411039
Amhara	-1.391795	.1130585	-12.31	0.000	-1.613386	-1.170204
Benshangul	.1714804	.1138025	1.51	0.132	-.0515684	.3945292
Diredawa	1.299707	.1124271	11.56	0.000	1.079354	1.52006
Gambella	-.522796	.1197974	-4.36	0.000	-.7575946	-.2879974
Harari	2.225665	.1146368	19.41	0.000	2.000981	2.450349

SNNP	1.3747	.1095806	12.5	0.000	1.159987	1.589535
Somale	-2.328	.1526449	-15.26	0.000	-2.627871	-2.029515
Tigray	-3.056	.2549783	-11.99	0.000	-3.556114	-2.556618
Amharaethn	2.210	.1017893	21.71	0.000	2.010503	2.40951
Gurageethn	2.661	.1875264	14.19	0.000	2.294	3.02909
Oromoethn	1.049	.0953815	11.00	0.000	.8627198	1.236608
Tigratethn	2.00	.246786	8.12	0.000	1.519301	2.486684
Femalehead	-.5568	.0571354	-9.75	0.000	-.6688772	-.4449106
RuralID	-5.73	.1205239	-47.61	0.000	-5.974516	-5.502071
Constant	3.1259	.283853	11.01	0.000	2.569622	3.682305
(wealthindex=1 is the base utcome)						

ትምህርትና ቴክኖሎጂ  
 ምረቃ ትምህርት  
 ትምህርት ማዕከል  
 አዲስ አበባ

## Declaration

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university, and that all materials used for the thesis have been duly acknowledged.

### Declared by:


Name: TEMESGEN FITAMU

Signature: 

Date: 09-07-2008

### Confirmed by Advisor:

Name: Mulat Demete

Signature: 

Date: 09-07-2008



Place and Date of submission 10-07-2008, ADDIS ABABA