An economic analysis of women's schooling on fertility and contraceptive use in developing countries: A case study of Tanzania

Ayoub Shaban Ayoub
University of Nevada, Las Vegas

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AN ECONOMIC ANALYSIS OF WOMEN'S SCHOOLING ON FERTILITY AND
CONTRACEPTIVE USE IN DEVELOPING COUNTRIES: A CASE STUDY OF
TANZANIA

by

Ayoub Shaban Ayoub

Bachelor of Arts
University of Dar es Salaam
1998

A thesis submitted in partial fulfillment
of the requirements for the

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Department of Economics
College of Business

Graduate College
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AYOUB SHABAN AYOUB

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ABSTRACT

An Economic Analysis of Women’s Schooling on Fertility and Contraceptive Use in Developing Countries: A Case Study of Tanzania

by

Ayoub Shaban Ayoub

Dr. Mary Riddel, Examination Committee Chair
Assistant Professor of Economics
University of Nevada, Las Vegas

This study explores the economic relationships between women’s schooling, fertility rates, and contraceptive use in Tanzania where population growth and fertility rates are among the highest in the world and aggravate the already ailing economy. Two models are used: fertility and contraceptive use. The study surveys women ages 15 to 49 drawing on 1996 data from the Demographic and Health Surveys (DHS). The study finds that women’s schooling and other socioeconomic variables are important factors in explaining reproductive behavior. The fertility model indicates that education levels are consistently associated with lower fertility rates, while the contraceptive use model indicates that education is positively associated with contraceptive use. Overall, the findings stress the key role of women’s education in reducing their desire for large family by improving their economic opportunities and the market value of their time.
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CHAPTER 1

INTRODUCTION

On October 12th, 1999, the United Nations announced that global population had reached the 6 billion mark, just 12 years after passing 5 billion (World Population Data Sheet, 2002). Based on the United Nations Population Division’s most recent projections, the global population could reach the 7 billion mark as early as 2011 or as late as 2015. Most of the increases in population growth can be attributed to developing countries especially in Sub-Saharan Africa (SSA) countries where fertility rates are very high. Even though population trends remain difficult to predict, it is beyond a doubt that understanding global population projections requires an analysis of fertility rates.

High fertility rates could be one of the major deterrents to sustained economic growth in SSA countries. The ill-effects of population growth can be observed at the macro level as well as the micro level. At the macro level, high population growth combined with stagnant income can result in growing income inequalities, lack of economic opportunities and high level of unemployment. In SSA countries where the productivity level is low, food production cannot keep up with population growth, which leads to food insecurity. SSA countries are predominantly agricultural based which puts pressure on land used; densely populated area results in limited arable land for production and consumption.
Another problem created by high population growth is congestion and rapid depletion of resources, especially in developing countries where property rights governing access to the resources are not well-defined. This leads to overexploitation of resources, pollution, and degradation of the environment. Moreover, pressure on limited land availability in the rural areas due to high population growth has contributed to a massive migration of peasants to urban centers. Indeed, migration to the city has led to the mushrooming of slums in the cities, which has exacerbated the problems of unemployment, lack of proper hygiene, and education opportunities.

At the micro level, high population growth leads to a more serious issue of poverty. Poorer families, especially women and marginalized groups, bear the burden of a large number of children with fewer resources per child, further adding to the spiral of poverty and deterioration in the status of women. Low levels of income among the poorer families with many children leads to inadequate food availability, which perpetuates malnutrition, which in turn accelerates high levels of infant and maternal morbidity and mortality. Studies such as Ernst and Angst (1983), Rodgers (1984) and King (1985) have reviewed the relationship between family size, mean education and the health of children. Among poorer families, beyond a certain family size, additional children are usually associated with lower average educational attainment and reduced levels of child health as measured by nutritional status, morbidity and mortality.

relationship between female education and fertility. Generally, these studies found that fertility fell uniformly with increased levels of women’s education. Moreover, in their research in SSA and Latin America, Jejeebhoy (1995) and Martin (1995) showed that the inverse relationship between education and fertility can be enhanced only after relatively high levels of education have been attained.

Declining fertility has been the product of tremendous efforts in family planning. It has probably been hastened by break-throughs in contraceptive technology such as the Intrauterine devices (IUD’s) and contraceptive pills. Birth rates and population growth rates have begun to fall in North America, Europe, Australia, and parts of developing world since the early 1960s. However, World Population Data Sheet (2002) data show fertility rate decline in developing countries is still very low, particularly in SSA countries. Despite the fact that Sub-Saharan Africa is the poorest segment of the world, its fertility rate is currently at 5.6 children born per a woman which is over and above the world’s fertility rate which currently stands at 2.8 children per a woman. Africa’s fertility rate is also over and above that of the continent of Asia, home of the two most populous nations, which is currently at 2.6 children per a woman.

This study explores the economic relationships between women’s schooling, fertility rates, and contraceptive use in developing nations. The study uses the case of the United Republic of Tanzania, hereafter Tanzania. The choice of Tanzania has been facilitated by the fact that previous research has tended to aggregate observations from many countries, and not much has been written specifically about Tanzania. Also, Tanzania is the largest of the East African nations with as much cultural and economic diversity that can be found in almost the entire region. Therefore, the results could be
similar and indicative of the whole region. Results may also be different and specific to Tanzania. It can be important for policy makers to know how Tanzania is same or different from other parts of Africa.

Like most of previous studies in the analysis of fertility, this study uses the field data from Demographic and Health Survey (DHS) conducted in 1996. The Demographic and Health Surveys program is funded by USAID and implemented by Macro International Inc. MEASURE DHS+ which assists developing countries worldwide in the collection and use of data to monitor and evaluate population, health, and nutrition programs. The survey data provide information on family planning, maternal and child health, child survival, HIV/AIDS/STIs (sexually transmitted infections), and reproductive health.

Two models are used: the first is the negative binomial regression model that estimates the probability that increasing women’s schooling levels lowers fertility rates in Tanzania. The second method uses logit model to estimate the relationship between women’s schooling levels and contraceptive use. This study investigates two hypotheses concerning women’s reproductive behavior: (1) that education tends to lower women’s fertility, and (2) that educated women are more likely to use contraceptives.

Brief History and Geography of Tanzania

Before going further, it is necessary to give a background of Tanzania. Tanzania (then Tanganyika) became a German colony in the 19th century. German colonial interests were first advanced in 1884. However, before the German colonized the country, there were Arabs and Portuguese. The Arabs are believed to be in the country...
earlier before the 13th century mainly for gold and ivory trade but centuries later the trade turned to slaves as commodity. While Portuguese did not colonize Tanzania, by 1506, it claimed control over the entire coastal area after destroying the Arabs settlement in the early 1500s. In the 18th century, with the help of the Arabs, the indigenous coastal dwellers were able to drive the Portuguese from the area and Arabs claimed the coastal strip.

German colonial domination of Tanganyika ended after World War I when control of most of the territory passed to the United Kingdom under a League of Nations mandate. After World War II, Tanganyika became a UN trust territory under British control. Subsequent years witnessed Tanganyika moving gradually toward self-government and independence.

On December 9th, 1961, Tanganyika got its full independence from the United Kingdom. A little over three years after Tanganyika’s independence, on April 26th, 1964, the United Republic of Tanganyika and Zanzibar was formed. Later on that year October 29th, 1964, the country was renamed the United Republic of Tanzania. Zanzibar is an island that was ruled by Arabs and in 1890, following Anglo-German rule was made a British protectorate. Zanzibar received its independence from the United Kingdom on December 19, 1963, as a constitutional monarchy under the Sultan. On January 12, 1964, the African majority revolted against the sultan, and a new government was formed.

Tanzania covers 940,000 square kilometers, 60,000 of which are inland water. Tanzania lies south of the equator and shares borders with eight countries: Kenya and Uganda to the north; Rwanda, Burundi, Democratic Republic of Congo (former Zaire) and Zambia to the west; and Malawi and Mozambique to the east. Tanzania has vast
areas of lakes and rivers. Lake Tanganyika, which is the Africa’s deepest and longest freshwater lake and the world’s second deepest lake, runs along the western border. Lake Victoria is the second largest lake in the world and drains into the Nile River and then to the Mediterranean Sea is also partly shared by Tanzania. The Rufiji River is Tanzania’s largest river and drains into the Indian Ocean south of Dar es Salaam.

Also, Tanzania is the home of the roof of Africa, the tallest mountain in the continent, Mount Kilimanjaro. Mount Kilimanjaro situated in the northern part of the country rises to 5,895 meters, which makes it the third highest point in the world. The main climatic feature for most of the country is the long dry spell that runs from May to October, followed by a period of rainfall between November and May. The coast and the areas around Mount Kilimanjaro, receive heavy rainfall from March to May, with short rains between October and December. Around Lake Victoria and the western part of the country, rainfall is well distributed throughout the year, with a peak period between March and May.

In general, a great part of Tanzania’s land is fertile and gets sufficient rains. The country produces various food crops such as maize, rice, wheat, beans, and groundnuts. It also produces such cash crops as sisal, cotton, coffee, tobacco, pyrethrum, and tea. The land is also good for grazing cattle, goats, sheep, and poultry farms. The Indian Ocean, Lake Victoria, other small lakes and rivers are good sources of fish. Agriculture, which comprises crops, animal husbandry, forestry, fishery, and hunting, contributes the largest share of any sector to the gross domestic product (GDP).
Education System of Tanzania

The structure of Tanzania’s education system is as follows: Primary education lasts for seven years, divided into two stages of four and three years respectively. It culminates in the Primary School Leaving Certificate. Secondary school is divided into six Forms. Lower secondary school includes Forms I-IV and culminates in a national examination. Those who pass obtain the Certificate of Secondary Education Examinations (CSEE). Upper secondary school includes Forms V-VI and culminates in a national examination. Those who pass obtain the Advanced Certificate of Secondary Education Examinations (ACSEE) which gives access to higher education. Universities and several training colleges and institutes provide higher education. In addition, there are several training centers designed primarily for Form VI-leavers.

Beginning in secondary education level throughout higher education, the language of instruction is English. However, in the first four years of primary school the language of instruction is Swahili, while in the last three years of primary school, an English course is introduced, but all other courses are taught in Swahili. Therefore, there is a language impediment in the transition from primary school where the language of instruction is predominantly Swahili to secondary and higher education where the language of instruction is predominantly English.

Population Census of Tanzania

Tanzania conducted its first population census in 1967 which reported a total population of 12.3 million people. Since then, the population census has been conducted in an interval of 10 years or so. According to the 1978 census, the population had
increased to 17.5 million people while the census of 1988 revealed that the population had increased to 23.1 million people. The result of the last census conducted in 2002 will be published soon. However, in his message, ushering in the year 2003, the President of the United Republic of Tanzania announced that the population has reached over 34 million people. Tanzania is still sparsely populated, but the population density is high in some areas of the country, although the population is still predominantly rural. The proportion of urban residents has been increasing steadily from 6 percent of the total population in 1967 to 18 percent in 1988. This suggests that the country's level of urbanization is still very low.

The steady increase in population is a clear indication that Tanzania like any other SSA countries is plagued with issues of higher fertility rates. According to the Tanzania Reproductive and Child Health Survey (TRCHS) conducted in the second half of 1999 there has been a small decline in fertility since the 1996 survey (of which this study uses the data). The total fertility rate has dropped from 5.8 in the period of 1994-96 to 5.6 for the period of 1997-99.

A number of reasons explain the high fertility rate in Tanzania. First and most important, high fertility rates are due to unplanned pregnancy. According to the TRCHS findings, more than one-fifth of overall births in three years prior to the 1999 survey were reported to be unplanned. This rate is higher among older women who already have several children. A second reason for the higher fertility rate in Tanzania is the culturally based idea of proper family size. Tanzanian couples are still fond of larger families. TRCHS found that even those families that have fewer children would like to have an average of five children. Low contraceptive use is yet another reason to blame for the
higher fertility rate. Even though the contraceptive prevalence rate has doubled since 1991-92, from 10 to 22 percent (TRCHS, 1999), this rate is still low as compared to that developed countries. The World Population Data Sheet (2002) reveals that whereas the percent of married women aged 15-49 using all methods of contraception is 76 and 69 in United States and Canada respectively, in Tanzania, it is only 25. Graph 1 highlights this claim. The graph compares total fertility rate trends of developed countries with those of other SSA countries in general and Tanzania. From graph 1, it is evident that the fertility rates for both SSA countries and Tanzania are significantly higher than those of developed countries.
Graph 1. Total Fertility Rates

For years 1995-2050, the estimates are based on medium variant.
CHAPTER 2

LITERATURE REVIEW

There exists a large theoretical literature on the relationships between a female’s education, fertility, and contraceptive use. Generally, the results are consistent with predictions of utility theory, showing that women with more schooling behaved rationally when considering their family sizes by having fewer children. However, there is little empirical studies tying together women’s schooling, fertility, and contraceptive use. While advancing the understanding of the determinants of fertility and contraceptive use, previous studies have focused on only a few variables. For example, they have neglected to examine the role of other important factors such as cultural traits in fertility and contraceptive use decisions. This chapter provides a brief review of the literature organized around three important topics: (1) microeconomics approaches to fertility, (2) the relationship between education and fertility, and (3) other determinants of fertility.

Microeconomics Approaches to Fertility

The conventional theory of consumer behavior views an individual as trying to maximize utility, given a range of goods and services, their prices, and the individual’s taste and income. According to Easterlin (1975) a couple’s demand for children can be treated as similar to the demand for goods and services; fertility is seen as an answer to
the couple’s demand for children relative to other goods. Indeed, demand for children depends on household income, on the cost of children, and on parents’ tastes or preferences for children relative to other goods and services that provide utility to the couple. *Ceteris paribus,* economic theory suggests that a higher income is expected to be associated with a greater demand for children, if children are treated as normal goods. However, according to Becker (1965) increased expenditures on many commodities for the most part take the form of increased quality, and the increase in quantity is modest.

Michael (1973) posits that parents’ education is the accumulation of stock of knowledge, physical and mental skills that are acquired in the years spent schooling. All of these accumulations constitute productive human capital. Therefore, investments in education heighten one’s earnings capacity, increase one’s time value in the labor market, and raise one’s full money income. These changes may, in turn, affect the relative prices of children and child services, and these relative price changes (concomitant with changes in wealth) may alter the quantity of child services a household demands. Michael characterizes this phenomenon as “pure income effect”.

In the same vein, according to Becker (1965) the effect of a change in the price of time on the relative price of a commodity depends upon its time intensity. In previous and current literature on human fertility such as of Michael (1973), Ainsworth et al. (1996), it is generally assumed that children or child-related consumption is relatively intensive in the woman’s time. Hence, Michael (1973) claims that a key economic explanation for the woman’s education-fertility inverse relationship is that, the higher the woman’s education level, the higher is her time value and thus the greater is her incentive to substitute away
from nonmarket activities which are intensive in her time, this leads to a “substitution effect.”

In advanced economy, such as the United States where the level of a woman’s schooling is relatively high, the market value of a woman’s time is higher than the price of goods. Becker (1965) argues that this paradox is a result of a reaction to a difference in relative costs as a result people in advanced economies with higher education levels tend to be stingy about time and lavish about goods. In this framework, increases in time value of a woman (child bearer) will most likely reduce the number of children she would like to bear.

The Relationship between Education and Fertility

The association between education and fertility has a long history in the fields of economics and demography. Numerous studies relating national or regional levels of education and fertility showed a significant inverse relationship between the two. Cochrane (1979) argues that earlier economists such as Malthus and his successors have proposed numerous theories about why more education is inversely related with fertility.

However, the relationship between education and fertility is much more complex than suggested. Though the underlying pattern most commonly known shows a negative relationship, there are instances where positive relationships at very low and very high levels of schooling have been found. Bledsoe, Casterline, Johnson-Kuhn and Haaga (1999) suggest that understanding the nature and strength of the relationship between education and fertility remains a central challenge both for researchers seeking to
elucidate demographic and social changes and for policy makers who must decide on the allocation of scarce public resources.

Jejeebhoy (1995) did an extensive review of 59 studies in developing countries and found a variety of curvilinear relationships, no (or zero-effect) relationships, and positive relationships in which fertility increases systematically with education. Jejeebhoy categorizes four patterns of the relationship between education and fertility. In the first pattern, there is a straight inverse relationship between education and fertility. This pattern supports the much known hypothesis that fertility falls monotonically with increased in women’s years of schooling. The second pattern depicts an inverted U or J-shaped curvilinear relationship. This pattern indicates that the first few years of schooling increases fertility initially, but the trend is eventually reversed. The third pattern is almost similar with the first one but the relationship is 7-shaped. The 7-shaped curve means that the first part of the curve is horizontal which suggests that the first few years of schooling have either no effect on or produce a slight rise in fertility. The second part of the curve indicates that the curves falls dramatically which indicates more years of schooling have inverse relationship with fertility. In the fourth pattern, a positive or no relationship has been demonstrated. However, the positive relationships have rarely been observed in recent literature.

The negative effect of education on fertility deserves further analysis. According to Martin and Juarez (1995, pp. 53), education is a “source” of knowledge transmission, “vehicle” of socioeconomic advancement, and a “transformer” of attitudes. In the contemporary world, any development depends on the effective transmission of new information. As a source of knowledge transmission, Martin and Juarez discuss that
schooling imparts literacy skills, which enable people to process a wide range of information and arouse cognitive change that shape individuals' interaction with their surrounding environment. As a vehicle of socioeconomic development, the authors hypothesized that education not only enhances cognitive abilities, but also it opens up economic opportunities and social mobility. In the contemporary world, education credentials open the door for formal employment and for sorting individuals into the hierarchy of occupations. Moreover, Martin and Juarez (1995) explain that as a transformer of attitudes, schooling's role in attitude formation goes far beyond the enhancement of conceptual reasoning and may lead to crucial transformations in aspirations and, eventually, to questioning traditional beliefs and authority of structures. Education transforms individual attitudes and values from traditional toward modern and thereby enhancing modernization, which is essential and reliable to regulate fertility.

Cochrane (1979) hypothesized that education does not affect fertility directly but it acts indirectly by delaying entry into marriage and by contributing significantly to a woman's knowledge of birth control. Regarding the demand for children, Cochrane (1979) hypothesized that education effects appear to be on the perceived costs and benefits of children and on family size preferences. Probably a more intuitive explanation of the economic model of fertility provided by Cochrane is the link between women’s schooling and fertility regulation. Studies have hypothesized that education is related to favorable attitudes toward birth control, improved knowledge of birth control, and better spousal communication, which lead to effective use of contraception.

Ainsworth et al. (1996) posited that women’s schooling lowers fertility and by inference raises contraceptive use through four main channels: wage effects, higher
demand for child schooling, lower child mortality and more effective use of contraception. It is widely hypothesized that a woman’s schooling not only increases her chances of entering the labor market but also leads her to command a higher wage. Among the effects of higher wage is the opportunity cost of women’s time in rearing children which in turn raises the cost of children who are generally time-intensive.

Educated women are more likely to exercise the “quality-quantity trade-off” of their children. Most of these women are likely to see the benefit of their schooling; they may develop higher aspirations for their own children’s schooling. It is obvious that as the number of children increases, familial resources available to an individual child decrease. Restricting the number of children is the best solution in order to have better-educated children and more familial resources per child. It would be advantageous for a woman to have fewer children that she can afford to pay for the tuition and other related fees associated with schooling, hence the trade-off between quality and quantity of children. Ainsworth et al. (1996) found that the trade-off is not a new phenomenon in most of the developed society, but it is a recent trend that can be seen in some parts of SSA countries.

Other Determinants of Fertility

Besides education, a large number of variables can affect fertility and contraceptive use. For example, Bongaarts, Frank, and Lesthaeghe (1984) consider two groups of variables: socioeconomic variables and proximate variables. Socioeconomic variables include education, social, cultural, economic, and health variables whereas proximate variables include biological and behavioral variables such as contraception and
age of a woman. Davis and Blake (1956), Bongaarts and Potter (1983) hypothesize that in order for the socioeconomic variables to affect fertility; they must operate through proximate determinants.

Cultural traits such as son preference and number of siblings are important to explain fertility behavior in a traditional society such as Tanzania, therefore, they deserves to be studied in detail. Son preference is not an uncommon phenomenon among SSA countries. Khan and Khanum (2000) found that sons are generally preferred over daughters owing to a complex interplay of economic and socio-cultural factors. Hank and Hans-Peter (2000) suggest that son preference is embedded in cultural and religious traditions and community norms as well as economical factors, shaping individual attitudes and behavior. In most developing countries where women are economically and socially dependent on men, male offspring are presumed to have greater economic net utility than female offspring. The argument is that sons can help to provide old age support to their parents. This is particularly important in most developing countries where there is no other form of old-age security. Hank and Hans-Kohler (2002) suggest that sex preferences for children might have implications for a couple’s fertility behavior, where parents who desire one or more children of a certain sex should tend to have larger families than would otherwise be the case.

Duncan, Freedman, Coble and Slesinger (1965), Axinn, Clarkberg, and Thornton, (1994) have found a direct relationship between the number of children born to a family and the number of children within the couple’s (husband and/or wife) family. In other words, a couple from larger families is more likely to mimic the sexual behavior of their parents hence breeding intergenerational inheritance of family size.
CHAPTER 3

EMPIRICAL MODELS

This chapter presents two models that analyze the effects of women's schooling and other socioeconomic variables on fertility rates and contraceptive use. The first model analyzes the determinants of fertility, while the second model deals with contraceptive use. These two models are dependent upon socioeconomic, demographic and proximate variables and are derived from a basic utility maximization model. Definitions of the dependent and independent variables are contained in table 1. The fertility model assumes that women attempt to maximize their level of utility given all goods and services, including non-market goods. The dependent variable is measured as count data which could yield biased estimates using least square method. A negative binomial regression method is therefore used (see, Long 1997, pp. 217). Accordingly, we specify the following model:

\[ \text{Fert} = \beta_0 + \beta_1 \text{Edprimar} + \beta_2 \text{Edsecond} + \beta_3 \text{Edhigher} + \beta_4 \text{Knows} + \beta_5 \text{Contr} + \beta_6 \text{Green} + \beta_7 \text{Lnage} + \beta_8 \text{Urban} + \beta_9 \text{Tv} + \beta_{10} \text{Mored} + \beta_{11} \text{Sibl} + \epsilon \quad (\text{eq. 1}) \]

The dependent variable is the number of children per a woman. The independent variables include woman's schooling levels, her knowledge of ovulatory cycle, contraception, family planning, age, place of residence (urban vs rural), income, son preference and number of her siblings. On the other hand, the model describing
contraceptive use employs the logit technique because the dependent variable is
dichotomous. The model takes the form:

$$P(\text{Contr}) = \beta_0 + \beta_1 \text{Edprimar} + \beta_2 \text{Edsecond} + \beta_3 \text{Knows} + \beta_4 \text{Green} + \beta_5 \text{Lnage} +$$
$$\beta_6 \text{Urban} + \beta_7 T_v + \beta_8 \text{Sibl} + \beta_9 \text{Mored} + \epsilon_2 \quad \text{(eq. 2)}$$

The dependent variable is the probability that a woman uses contraceptive before her first
child, while the independent variables are similar with those of the fertility model, with
the exception that in this model contraceptive use is a dependent variable. Another
exception is the exclusion of higher education variable because every woman who has
higher education uses contraceptives. It is worth emphasizing that the signs of the
coefficients in the contraceptive use model are opposite to those observed in the fertility
model (e.g. Ainsworth et al. 1996). Therefore for simplicity, the remaining discussion of
the expected signs of the coefficients is based on the fertility model. If an independent
variable in the fertility model has a positive sign, the same variable is expected to have a
negative sign in the contraceptive use model and vice versa.

Women's schooling is incorporated in the study in three distinct ways: primary
education (Edprimar), secondary education (Edsecond), and higher education (Edhigher).
It is expected that women's schooling will have a negative coefficient. Given the
opportunity costs of childrearing (which is time-intensive), the utility of the woman will
be maximized by reducing the number of children to reproduce and spend more time in
other earnings-activities.

The knowledge of ovulatory cycle may also affect the probability of a woman to
have fewer children. This is especially important in developing countries such as
Tanzania where the number of unwanted births is very high partly because of women not
knowing their reproductive cycle. The variable (Know) was measured by asking a woman at what time during her menstrual cycle she is likely to get pregnant. It is expected that the variable will have a negative coefficient.

The use of contraceptive is measured by coding the variable Contr 1 if a woman used contraceptive before her first child; otherwise the variable is coded zero. Contraceptive use is one of the important determinants of fertility control. The variable is expected to have a negative coefficient suggesting that efficient contraceptive use reduces the number of children born per woman.

The variable Green is used in this study to see the influence of family planning knowledge on number of children born per a woman. The variable is measured by asking women if they ever heard a local family planning program in Tanzania. It is expected that the variable will have a negative coefficient to indicate that knowledge of family planning decreases the number of children a woman may have.

The probability of a woman having many children also depends on her age. Women were asked their age. This study uses Lnage which is age in natural log form to reduce the impact of age as age increases. The survey used in this study covers women aged 15 to 49. The mean age of the respondent was 28. This means that most of the respondents were in their childbearing age. Therefore, the coefficient of the age variable is expected to be positive.

The variable for urbanization (Urban) is 1 if a woman lives in the city. The coefficient on the variable Urban is expected to be negative suggesting that women who live in urban areas will have fewer children than their counterparts in the rural areas.
The coefficient of variable $Tv$ which is proxy for income is expected to be negative which suggests that women with relatively high income tend to have fewer children so that they can have more time to spend on income-generating activities. Another reason is that women who have more income would rather have fewer children than many in order to have more expenditure per child, which improves the quality of children as opposed to the quantity of children.

The coefficients of the cultural-trait variables: son preference ($Mored$) and number of siblings ($Sibl$) are expected to be positive. This suggests that son preference has a higher probability in increasing the number of children especially when couple gets a child of a different sex from what they expected. Ceteris paribus, the number of siblings a woman has directly influences her reproductive behavior; that is, the more siblings a woman has, the more children she will bear.
Table 1: Variables Used for Both Models and their Definitions

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fert</td>
<td>Total number of children ever born per woman</td>
</tr>
<tr>
<td>Edprimar</td>
<td>1 if a woman has primary education level 0 otherwise</td>
</tr>
<tr>
<td>Edsecond</td>
<td>1 if a woman has secondary education level 0 otherwise</td>
</tr>
<tr>
<td>Edhigher</td>
<td>1 if a woman has higher education level 0 otherwise</td>
</tr>
<tr>
<td>Knows</td>
<td>1 if a woman has a knowledge of ovulatory cycle 0 otherwise</td>
</tr>
<tr>
<td>Contr</td>
<td>1 if a woman use contraceptive before first child 0 otherwise</td>
</tr>
<tr>
<td>Green</td>
<td>1 if a woman ever heard of a local family planning 0 otherwise</td>
</tr>
<tr>
<td>Lnage</td>
<td>a woman's age in log form</td>
</tr>
<tr>
<td>Urban</td>
<td>1 if a woman lives in urban residency 0 otherwise</td>
</tr>
<tr>
<td>Tv (income proxy)</td>
<td>1 if a woman has television set 0 otherwise</td>
</tr>
<tr>
<td>mored</td>
<td>1 if a woman has more daughters over sons 0 otherwise</td>
</tr>
<tr>
<td>Sibl</td>
<td>number of siblings a woman has</td>
</tr>
</tbody>
</table>
CHAPTER 4

DATA

The data for the project are drawn from the MEASURE DHS+ (Demographic Health Survey, 1996). The Demographic and Health Surveys program is funded by USAID and implemented by Macro International Inc. MEASURE DHS+ which assists developing countries worldwide in the collection and use of data to monitor and evaluate population, health, and nutrition programs. The survey data provide information on family planning, maternal and child health, child survival, HIV/AIDS/STIs (sexually transmitted infections), and reproductive health. In addition, DHS+ can assist with improving on-going data collection efforts, such as health information systems to efficiently meet information needs in a cost-effective manner.

To date, the DHS+ program has provided technical assistance to more than 100 surveys in Africa, Asia, the Near East, Latin America, and the Caribbean. DHS+ provides decision-makers with information necessary to plan, monitor, and evaluate population, health, and nutrition programs. In this way, DHS+ plays a major role in improving international understanding of global population and health trends. The survey instrument, which is fairly comprehensive, asks respondents a series of questions regarding educational attainment, contraceptive use, rural/urban domicile, and fertility. As such, the DHS survey data are appropriate for the scope of this project.

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The survey deals with 7,997 women aged 15 to 49. The descriptive statistics for the Tanzania DHS data set shown in Table 2 are nationally representative of all women who participated in the 1996 surveys. About 66 percent of the surveyed women had completed seven years of primary schooling, but about 6.6 percent and 0.05 percent have secondary and higher education, respectively. This leaves about 27 percent of the surveyed women without formal schooling. The primary school figure is relatively higher compared with the figures of secondary and higher education because since independence in late 1961, the Tanzanian government has made tremendous efforts to ensure that everybody attends at least seven years of primary schooling. Primary schools are scattered around the country and it is basically free for primary school age students to attend.

Table 2 also shows some interesting findings with regard to knowledge of ovulation and family planning. The table indicates that only about 16 percent and 4 percent of women know when they are likely to get pregnant (ovulate) and used contraception before their first child was born, respectively. In addition, about 39 percent are aware of family planning program launched by the Tanzanian government in 1993; about 26 percent of women live in urban areas. Roughly 3 percent have television set, a proxy for income level and about 30 percent have son preference.
Table 2: Descriptive Statistics

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Median</th>
<th>Maximum</th>
<th>Minimum</th>
<th>Std. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fert</td>
<td>3.0748</td>
<td>2.0000</td>
<td>15.0000</td>
<td>0.0000</td>
<td>2.9731</td>
</tr>
<tr>
<td>Edprimar</td>
<td>0.6562</td>
<td>1.0000</td>
<td>1.0000</td>
<td>0.0000</td>
<td>0.4750</td>
</tr>
<tr>
<td>Edsecond</td>
<td>0.0661</td>
<td>0.0000</td>
<td>1.0000</td>
<td>0.0000</td>
<td>0.2486</td>
</tr>
<tr>
<td>Edhigher</td>
<td>0.0005</td>
<td>0.0000</td>
<td>1.0000</td>
<td>0.0000</td>
<td>0.0224</td>
</tr>
<tr>
<td>Knows</td>
<td>0.1571</td>
<td>0.0000</td>
<td>1.0000</td>
<td>0.0000</td>
<td>0.3639</td>
</tr>
<tr>
<td>Contr</td>
<td>0.0381</td>
<td>0.0000</td>
<td>1.0000</td>
<td>0.0000</td>
<td>0.1915</td>
</tr>
<tr>
<td>Green</td>
<td>0.3838</td>
<td>0.0000</td>
<td>1.0000</td>
<td>0.0000</td>
<td>0.4863</td>
</tr>
<tr>
<td>Lnage</td>
<td>3.2843</td>
<td>3.3000</td>
<td>3.8900</td>
<td>2.7100</td>
<td>0.3318</td>
</tr>
<tr>
<td>Urban</td>
<td>0.2551</td>
<td>0.0000</td>
<td>1.0000</td>
<td>0.0000</td>
<td>0.4359</td>
</tr>
<tr>
<td>Tv</td>
<td>0.0309</td>
<td>0.0000</td>
<td>1.0000</td>
<td>0.0000</td>
<td>0.1730</td>
</tr>
<tr>
<td>Mored</td>
<td>0.2992</td>
<td>0.0000</td>
<td>1.0000</td>
<td>0.0000</td>
<td>0.4580</td>
</tr>
<tr>
<td>Sibl</td>
<td>5.8717</td>
<td>6.0000</td>
<td>17.0000</td>
<td>0.0000</td>
<td>2.7892</td>
</tr>
</tbody>
</table>

Source: 1996 DHS individual recode files.
CHAPTER 5

RESULTS

To analyze the impact of women's schooling and other socioeconomic variables on fertility and contraceptive use the study estimates two models, one that deals with fertility rate and the other that focus on contraceptive use. Section (5.1) presents the empirical results of the fertility model, while section (5.2) presents that of the contraceptive use model.

5.1 Regression Results of the Fertility Model

Table 3 shows the results of the negative binomial regression model as well as the marginal probabilities of the coefficients. Interpretation of the count data model using marginal probabilities makes more sense because "the partial derivative cannot be interpreted as the change in the expected count for a unit change" in an independent variable (See, Long 1997, pp. 224). Equation 3 shows how the marginal effect for the negative binomial is calculated (see Green, 2000):

\[ \frac{\partial P(y)}{\partial x} = \exp(\beta) \quad \text{(eq. 3)} \]

where \( y \) and \( x \) are dependent and independent variables, respectively and \( \beta \) is the slope coefficient of the independent variable. Accordingly, the direction for the change is the same as the sign of the coefficient (see Long and Freese, 2001).
The results show that women’s schooling significantly reduces the number of children born per woman. All the measures of women’s schooling are strongly significant and the coefficients are negative. The marginal probabilities of education variables show that if a woman has only primary education, the expected number of children born decreases by a factor of 0.961, holding all other variables constant. If a woman has secondary education, the expected number of children born decreases by a factor of 0.788 and if a woman has higher education, the expected number of children born decreases by a factor of 0.571, holding all other variables constant. The results are consistent with previous studies (e.g. Ainsworth et al. 1996, Martin and Juarez, 1995, and Adelman, 1963).

Higher education is however, not statistically significant, but the negative magnitude of the coefficient is higher than those of women’s primary and secondary schoolings. Notice that the negative effect of women’s education on fertility gets larger and larger with the increase in education levels. The insignificance of higher education coefficient may be explained by the fact that only 0.05 percent of the surveyed women have higher education beyond secondary school. More data may be needed to significantly capture this effect which unfortunately is not the case.

The coefficient of knowledge of ovulatory cycle (Knows) is positive and statistically significant at the one percent level indicating that if a woman has knowledge of ovulatory cycle, the number of children born will increase. The marginal effect of the coefficient shows that if a woman has knowledge of ovulatory cycle the expected number of children born increases by a factor of 1.079 holding all other variables constant. However, this is inconsistent with the model prediction even after using a two-stage least
squares (2SLS) model to see if there is a problem with endogeneity between the variable knows and fertility. The inconsistency might be due to the fact that only about 16 percent of the women know their reproductive behavior. Also, it is possible that a majority of those who know their reproductive cycle use the knowledge to have more children if they prefer a large family size.

The use of contraceptive also significantly lowers number of children born per woman. The coefficient on the contraception variable is negative and statistically significant at the one percent level, indicating that as contraceptive use increases, the number of children born per woman decreases by a factor of 0.491. This suggests that even though about 5 percent of the surveyed women used contraceptive before their first child was born, they used contraceptive efficiently and effectively. This finding is consistent with Rutenberg, Ayad, Ochoa and Wilkinson (1991) and Bongaarts, Mauldin and Phillips (1990) found that the increased use of effective family planning methods is the primary cause of dramatic fertility declines in many developing countries.

Family planning programs are very important in explaining a country's fertility rate and are expected to have a negative effect on fertility. However, the coefficient is positive, but not significantly different from zero. One possible explanation for this counter-intuitive finding could be that the local family planning program was launched officially in mid 1993 and the survey on which this study is based was conducted in 1996, just three years later so that the effect of the plan had not yet materialized. It also makes sense to assume that when the program was launched, most of the surveyed women had a higher fertility rate already. This suggests that the benefits of this family
planning program are not supported by the model, but may be supported by more timely data.

The logged women's age coefficient is statistically significant and has a positive sign which is consistent with expectation. Given that the mean age of the surveyed women is 28, suggesting that most of the women are in their childbearing age. The marginal probability shows that the responsiveness of a woman's age increases the expected number of children born by a factor of 0.435.

The coefficient of Urban is negative and statistically significant at the one percent level, denoting a negative relationship between women who live in urban areas and the number of children born per woman. The marginal probability suggests that if a woman resides in an urban area, the expected number of children born per woman decreases by a factor of 0.866. This finding is supported by Ainsworth et al. (1996), Coale and Watkins (1979) and Adelman (1963, pp.322).

The coefficient for the variable Tv is negative and statistically significant at the one percent level. The marginal probability shows that if a woman has television set, the expected number of children born decreases by a factor of 0.816. This finding reflects the stronger impact of mother's income on the time cost of children. The results support Becker (1965, pp 510) who hypothesized that "child care would seem to be a time-intensive activity that is not productive (in terms of earnings) and uses many hours that could be used at work" which is "earnings-intensive activity." Becker predicted that the opportunity cost of childbearing is higher to higher income families. This association between household income and number of children born per woman is probably the most important economic explanation of decreasing fertility rates.
The data also suggest that cultural trait of son preference represented by Mored is also statistically significant at the one percent level. This indicates that if a woman has son preference, the expected number of children born increases by a factor of 1.160. This shows that women who have son preference will continue to reproduce until they get a desired number of sons. The finding is consistent with Hank and Hans-Kohler (2002) who suggested that parents who desire one or more children of a certain sex should tend to have larger families than would otherwise be the case.

Lastly, the variable Sibl also has a significant impact on the number of children born per a woman. The corresponding coefficient is statistically significant at the one percent level and positive indicating that intergenerational inheritance of family size preference has a direct influence on fertility. The marginal probability indicates that number of siblings increases the expected number of children born by a factor of 1.016. This also implies that women are more likely to mimic the reproductive behavior of their parents. Duncan et al. (1965) and Axinn et al. (1994) have determined the direct relationship between the number of children born to a family and the number of children within the couple’s (husband and/or wife) family.
Table 3: Regression Results: Fertility Model-Negative Binomial

Dependent variable is the number of children born per a woman.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Marginal Probability</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edprimar</td>
<td>-0.040*</td>
<td>0.961</td>
<td>0.016</td>
</tr>
<tr>
<td>Edsecond</td>
<td>-0.238**</td>
<td>0.788</td>
<td>0.040</td>
</tr>
<tr>
<td>Edhigher</td>
<td>-0.560</td>
<td>0.571</td>
<td>0.398</td>
</tr>
<tr>
<td>Knows</td>
<td>0.076**</td>
<td>1.079</td>
<td>0.019</td>
</tr>
<tr>
<td>Contr</td>
<td>-0.712**</td>
<td>0.491</td>
<td>0.069</td>
</tr>
<tr>
<td>Green</td>
<td>0.011</td>
<td>1.012</td>
<td>0.016</td>
</tr>
<tr>
<td>Lnage</td>
<td>2.500**</td>
<td>0.435'</td>
<td>0.028</td>
</tr>
<tr>
<td>Urban</td>
<td>-0.144**</td>
<td>0.866</td>
<td>0.019</td>
</tr>
<tr>
<td>Tv</td>
<td>-0.203**</td>
<td>0.816</td>
<td>0.056</td>
</tr>
<tr>
<td>Mored</td>
<td>0.149**</td>
<td>1.160</td>
<td>0.015</td>
</tr>
<tr>
<td>Sibl</td>
<td>0.016**</td>
<td>1.016</td>
<td>0.002</td>
</tr>
<tr>
<td>intercept</td>
<td>-7.496**</td>
<td>0.001</td>
<td>0.102</td>
</tr>
<tr>
<td>LR statistics (12 df)</td>
<td>15562.25**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>7997</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: ** significant at 1 percent level.  
*significant at 5 percent level.  
1 the variable Lnage is in natural log form, therefore, its marginal effect is divided by mean age which is 28.
5.2 Regression Results of the Contraceptive-Use Model

Empirical results regarding the use of contraceptive are consistent with expectations. Columns 2 and 3 in table 4 show the coefficient estimates and the marginal probabilities of the used model. The marginal probability for the logit model is computed as:

\[ \frac{\partial P(y = 1)}{\partial x} = \Lambda(X\beta)(1 - \Lambda(X-\beta)) \beta \]  

(\text{eq. 4})

where \( X \) is the vector of the explanatory variable and \( \beta \) is vector of coefficient estimates and \( \Lambda(X\beta) = 1/(1 + \exp(-X \beta)) \).

The results show that women’s schooling significantly impacts the probability of using contraceptives. The coefficient on the primary education is positive, indicating that women’s primary education increases the chances of using contraceptive. The marginal effects show that if a woman has primary education, the likelihood of contraceptive use increases by a factor of 0.043, holding all other variables constant at their mean. The contraceptive use model also show that women’s secondary education is positive, indicating that if a woman has secondary education the likelihood of contraceptive use increases by a factor of 0.073, holding all other variables constant at their mean. The results of women’s schooling on contraceptive use are consistent with the a priori expectations, contraception is directly associated with the levels of women’s education. As the results show women’s schooling is positive and statistically significant at the one percent level on both primary and secondary education levels. The magnitudes of the coefficients increase with the increase in women’s education level. The results also confirm that women’s education increases receptivity of awareness and contraceptive use to control fertility. This is consistent with Bertrand et al. (1993) who found that education...
affect the distribution of authority within households, whereby women may increase their authority with husbands and affect fertility.

Correct knowledge of a woman’s ovulatory cycle as measured by the variable \( \text{Knows} \), is positive and statistically significant at the one percent level. Its marginal effect suggests that if a woman has knowledge of ovulatory cycle, the likelihood of contraceptive use increases by a factor of 0.022. This suggests that women who know when they are likely to conceive are more likely to exercise contraception in case they do not intend to get pregnant.

The awareness of local family planning program (\( \text{Green} \)) significantly impacts the probability of contraceptive use. The coefficient on family planning program variable is positive and statistically significant at the one percent level. The marginal probability shows that if a woman is aware of a family planning program, the likelihood of contraceptive increases by a factor of 0.032, holding all other variables constant at their mean. This indicates that local dissemination of family planning knowledge is important to explain contraception. However, as mentioned in the previous section, the local family planning program was launched just three years before the survey was conducted. Therefore, the finding should be interpreted with a caveat because the dependent variable (contraceptive use) was measured as the use of contraceptive before a first child was born. In the fertility model, this variable was not significant; its significance in the contraceptive use model may be due the fact that people adjust more quickly on contraceptive use than on the fertility issue. Another reason may also be that most of the family planning programs not only disseminate information on family planning but also
on the sexual transmitted diseases. Therefore, people may opt to use contraceptive such as condom for the sake of having safe intimacy and not controlling fertility.

The results indicate that woman’s age is a strong indicator of contraceptive use. The coefficient on woman’s age is statistically significant at the one percent level. Since age (in natural log) is a continuous variable, the resulting coefficient shows the relation to the average age of respondents in the sample. The negative effect can be explained by the fact that the mean age of surveyed women is 28, which means that most of these women were in their childbearing age. Its marginal effect suggests that age’s responsiveness decreases the likelihood of contraceptive use by a factor of 0.002, holding all other variables constant at their mean.

The results show that urbanization significantly impacts the probability that an urban-based woman is more likely to use contraceptive than the rural based woman. The coefficient on Urban is positive, indicating that an urban resident will use contraceptive. The marginal probability shows that being an urban resident increases the likelihood of contraceptive use by a factor of 0.019, holding all other variables constant at their mean. This supports Bertrand et al. (1993) who found modern contraceptive use is higher in urban the in the rural areas. Hamill, Tsui, and Thapa (1990) attribute the more use in modern contraceptive among urban couples to the desire for smaller families. This also suggests that urban women may be more likely to use contraceptive (especially modern contraceptive methods) than rural women because of greater access to modern methods and medical care as well as other social amenities in urban areas.

Coefficient on household income as measured by the dummy of asset ownership (Tv) is positive which is consistent with a priori expectations. Its marginal effect indicates
that if a woman owns a television set the likelihood of contraceptive use increases by a
factor of 0.003, holding all other variables constant at their mean. However, the
coefficient is not statistically significant; the reason may be that this is a poor measure of
income. Unfortunately, DHS does not collect data on income or household resources.
This problem of poor measurement of income will persist and as a result will not be
possible to address precisely and with confidence the effect of income on contraception
in otherwise extremely rich DHS survey data.

Regarding the variable $\text{sibl}$, the result shows that women with many siblings are
less likely to exercise contraception as shown by the negative sign of the coefficient of
the variable. However, the coefficient is not different from zero, which suggests that there
is no relationship between the number of siblings and contraception and the exact reason
is far from clear.

The results also suggest that son preference is one of the major obstacles in using
contraceptives making it difficult to curb the fertility growth. The coefficient for son
preference ($\text{Mored}$) is negative and statistically significant at the five percent level. Its
marginal effect suggests that son’s preference decreases the likelihood of contraceptive
use by a factor of 0.013, holding all other variables constant at their mean. This is
consistent with a priori expectation that women who have a son preference will not use
contraceptive as long as they bear only daughters. They will continue that trend until they
are satisfied by having their desired number of sons. If they do not have a son at all they
will keep on bearing children until they reach menopause.
Table 4: Regression Results: Contraceptive Use Model-Logit

Dependent variable is 1 contraceptive used and 0 otherwise

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Marginal Probability</th>
<th>Standard Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edprimar</td>
<td>1.258**</td>
<td>0.043</td>
<td>0.293</td>
</tr>
<tr>
<td>Edsecond</td>
<td>2.135**</td>
<td>0.073</td>
<td>0.322</td>
</tr>
<tr>
<td>Knows</td>
<td>0.654**</td>
<td>0.022</td>
<td>0.143</td>
</tr>
<tr>
<td>Green</td>
<td>0.927**</td>
<td>0.032</td>
<td>0.138</td>
</tr>
<tr>
<td>Lnage</td>
<td>-1.772**</td>
<td>-0.002</td>
<td>0.234</td>
</tr>
<tr>
<td>Urban</td>
<td>0.564**</td>
<td>0.019</td>
<td>0.131</td>
</tr>
<tr>
<td>Tv</td>
<td>0.079</td>
<td>0.003</td>
<td>0.233</td>
</tr>
<tr>
<td>Sibl</td>
<td>-0.015</td>
<td>-0.001</td>
<td>0.023</td>
</tr>
<tr>
<td>Mored</td>
<td>-0.393*</td>
<td>-0.013</td>
<td>0.162</td>
</tr>
<tr>
<td>intercept</td>
<td>0.523</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LR statistics (9 df)</td>
<td>375.0920**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>n</td>
<td>7997</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: **significant at 1 percent level. *significant at 5 percent level.
In summary, women's schooling seems to indicate a clear, negative relationship with fertility. Almost all the variables used in the fertility model are significant at least at the 5 percent level. But the higher education and family planning variables were not significant at all. Also, the coefficients are consistent with a priori expectations except the variable *Knows* (knowledge of ovulatory) and variable *Green* (family planning knowledge). In general, schooling, contraceptive use, urbanization, and income are all negative, showing that these variables lead to a lower fertility rate. Likewise, age, son preference, and the higher the numbers of siblings, all show a positive relationship with fertility rate.

For the contraceptive use model, also, almost all the variables are significant between the 1 percent and 5 percent level except income and number of siblings. Women's schooling, knowledge of ovulatory cycle, family planning knowledge, and urbanization are all show a positive relationship; these variables lead to higher contraceptive use. Likewise, age, number of siblings, and son preference, all show negative relationship with contraceptive use.
CHAPTER 6

CONCLUSION

This study has examined the effects of women’s schooling and other socioeconomic and demographic factors on fertility and contraceptive use in Tanzania. The study finds strong support for the negative correlation between women’s schooling and cumulative fertility. The findings answer very important questions of how women’s schooling, which rarely addresses issues directly relevant to sexual, reproductive and contraceptive behavior influences fertility and contraceptive use decisions. Also, the study provides evidence of an established positive relationship between female’s schooling and contraceptive behavior.

The findings also substantiate that other explanatory variables such as cultural factors are important in dealing with the question of controlling fertility. As discussed in this study and various other studies, the indirect effects of female’s education on fertility and contraceptive use are much higher than the direct effects. One of the indirect applications of education is to empower women with decision-making and counteract cultures and norms that are associated with low prevalence of contraceptive use and increased fertility rate.

According to Becker (1992, pp.45) women’s education raises their labor participation which in turn raises their earnings, “and hence greater investment in market-
oriented skills” which increases women’s time value. Failure to recognize the crucial indirect effects of education on fertility and contraception is to undermine the role of female education.

Still unknown from this study: “Does the inter-relatedness between female’s schooling, fertility, and contraception depend on the quality of education?” Unfortunately, exogenous measures of the quality of education are not among those available in the individual DHS data set. The unavailability of that information, forces this study and previous studies to use either years of schooling or education levels to capture the impact of education on fertility and contraception. The quality of education depends on a variety of factors including a country’s education system. Given this caveat, one has to be careful in generalizing the results of this paper to other countries. Additional research is needed to take a closer look at how different education qualities behave differently in explaining fertility and contraception in developing countries where there is much diversity in the quality of education.

This study suggests that investment in women’s education should be a practical priority. Investment in primary education is necessary, but both fertility and contraception models show that the impact (magnitude) of education increases with education level. Therefore, the Tanzanian government should also invest on women schooling beyond primary school. The descriptive statistics show that less than 7 percent of the surveyed women have education beyond primary school level. Investment in females’ education in secondary and higher education will foster economic growth and also promotes smaller families, increase modern contraceptive use, and improve child health.


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VITA
Graduate College
University of Nevada, Las Vegas
Ayoub Shaban Ayoub

Local Address:
7221 Tempest Place
Las Vegas, NV 89145

Degrees:
Bachelor of Arts, Economics, 1998
University of Dar es Salaam

Special Honors and Awards:
Graduate with Honors, 1998

Thesis Title:
An Economic Analysis of Women’s Schooling on Fertility and Contraceptive Use in Developing Countries: A Case Study of Tanzania.

Thesis Examination Committee:
Chairperson, Dr. Mary C. Riddel, Assistant Professor, Ph.D.
Committee Member, Dr. Alan Schlottmann, Full Professor, Ph.D.
Committee Member, Dr. Djeto Assane, Associate Professor, Ph.D.
Graduate Faculty Representative, Dr. John P. Tuman, Assistant Professor, Ph.D.