FEMALE LABOUR FORCE PARTICIPATION AND FERTILITY: A STUDY OF WOMEN OF REPRODUCTIVE AGE IN KENYA

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DECLARATION

This research paper is my original work and has not been submitted for the award of a degree in any other university.

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X50/72235/2011

APPROVAL

This research paper has been submitted for examination with our approval as supervisors.

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Dr Mercy Mugo

Signed…………………………………………..Date…………………………………

Dr Anthony Wambugu

DEDICATION

I dedicate this research paper to my husband, Duncan Nderitu for his support and encouragement. I would also like to dedicate it to my beloved son, Prince Peter who had to be left at a very tender age of 2 months for me to join Master's degree classes. My dedication also goes to my dear parents for the sacrifices they made to provide me with good education.

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LIST OF ACRONYMS

ILO   International Labor Organization

IV   Instrumental Variable

KNBS   Kenya National Bureau of Statistics

LFP   Labor Force Participation

OLS   Ordinary Least Squares

OECD   Organization for Economic Cooperation and Development

SSA   Sub Saharan Africa

UNDP   United Nations Development Programme

WDI   World Development Indicators

ABSTRACT

Female labor force participation rate increased from 70.7% in 1986 to 76% in 2005/06.

Participation of women in the labor force promotes economic growth and assist in the achievement of Millennium Development Goals. However, women are underrepresented in the labor force as their participation is lower than male participation rates. The rise in female labor force participation in Kenya coincided with a decline in fertility rate over the same period. Little is known about how fertility affects female labor force participation in Kenya. The objective of this paper is to investigate the effect of fertility on labor force participation of women of reproductive age in Kenya. The study adopted the neoclassical labor supply theory to derive a theoretical model. Demand functions for leisure, children and consumption were derived by maximizing a woman's utility function subject to the full income constraint. From the demand functions a labor force participation equation was developed. Given that fertility is potentially endogenous, the study made an attempt to instrument for fertility. However, the instruments used were weak. Therefore, the study used a probit model and data from Kenya Demographic Health Survey 2008-2009 to identify the factors that influence a woman labor force participation decision. Results indicated that number of children born and living to a woman and higher education attainment increases the probability of women participating in the labor force. Women with children under 5 years, Muslims and married women are less likely to participate in the labor force. Results also show that being a resident in North Eastern region of Kenya reduces probability of participating in the labor force. The policy implication of this finding is that policies that aim at freeing much of women's

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time such as putting preschool facilities, subsidizing childcare and so on should be pursued. Information and education programmes are needed to enlighten women on the benefits associated with participation in economic activities. This study focused much on how fertility affects female labor force participation. Future studies should consider analyzing how schooling affects both fertility and labor force participation of women in Kenya. This study provides additional evidence that fertility affects female labor force participation positively.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

In Kenya, the government recognizes that social cohesion cannot be achieved if large sections of the population live in poverty (Republic of Kenya, 2010). It has therefore emphasized the need to invest in women and other vulnerable groups to enhance their participation in economic activities. As a result the government, private institutions and international organizations have come up with various policies and interventions to promote participation of women in economic activities. For instance, the Employment Act No.11 (Republic of Kenya, 2007) prohibits discrimination against women in access to employment opportunities and at the work place.

The Constitution of Kenya (Republic of Kenya, 2010) acknowledges that there has been discrimination against women. This has led to greater inequality between men and women. To reduce the gender inequality, the constitution prohibits discrimination on the basis of sex in access to opportunities in social, economic and political activities. It guarantees representation of women in key decision making organs such as parliament, judiciary and other senior public offices. It also gives women the right to acquire, inherit and own land. This makes it possible for women to use title deeds as collateral for loans in order to acquire capital to start their own businesses. Women who are actively involved in farming can now boost their production by using title deeds as collateral to acquire farm inputs. This creates more employment opportunities for women and increase earned income amongst women.

In the past, women in Kenya had limited access to credit; education and training opportunities. This hindered them from starting their own businesses. To address this problem, the government through women enterprise development fund together with various microfinance institutions such as Kenya Women Finance Trust, Faulu Kenya, Equity Bank of Kenya provide ease of access to cheap credit to women entrepreneurs. Women are also trained on business development skills which enable them to start their own businesses enterprises thus promoting self-employment.

There are several benefits that accrue from an increase in better employment opportunities for women. Tsani et al (2012) argue that women human capital is underutilized both at the national and global level. Full utilization of their expertise will accelerate and sustain economic growth .They therefore advice that policies should be put in place to eliminate barriers that hinder women from participating in economic activities. According to ILO (2009), ensuring more equal time use between men and women will assist in reducing gender inequality in the labor market. OECD (2008) points out that woman comprise more than 70 % of the poor in the world. Therefore increased participation of women in the labor force will promote growth, reduce poverty and inequality within the society.

In Kenya, small and medium enterprises are among the major drivers of economic growth. Increase in women entrepreneurs will create more jobs and empower women. The empowerment of women enables them to have power and control over strategic decisions such as their own reproductive health. Better and well paying jobs will also

raise the incomes of the poor women and enhance their ability to invest in social security schemes (OECD 2009) .This enables women to invest human capital acquisition which raises their productivity and their incomes. Social security schemes also offer social protection in times of economic hardship which fosters social cohesion and stability in the society.

Klasen (2005) observed that increased number of employed women reduces gender inequality in employment. This induces economic growth and facilitates achievement of Millennium Development Goals such as improved maternal health care, reduced child mortality and improved nutrition. According to UNDP (2007) when women are adequately represented in all decision making organs the quality of governance increases and corruption also tends to decline.

Labor force participation is the proportion of country's working age population that is actively engaged in the labor market (ILO, 2010). This includes those who are self-employed, part time and full time employees and the unemployed. In Kenya, working age group comprises of those aged 15 to 64 years ((Republic of Kenya, 2008a) and this study follows this definition. It defines labor force participation as the percentage of the population aged 15 to 64 years that is employed or unemployed and actively seeking for work.

There has been a small decline in female labor force participation rate in the world over the period 1992 to 2012 (ILO, 2012). The participation rates declined from 52.4 percent in 1992 to 52.1 percent in 2002 and 51.1 percent in 2012. The decline may be attributed to longer periods of schooling, increased detachment from the labor markets, higher retirement of women, increase in fertility rates and gender inequality in time spent on household activities such as childcare (ILO, 2012). In Contrast, female labor force participation rates in Sub Saharan Africa exhibit an upward trend from early 1990's. In 1992, the participation rates stood at 60.3 percent. This increased to 63.5 percent and 64.6 percent in 2002 and 2012 respectively. Possible causes of the increase include increased access to child care, reduction in fertility, change in technology and increased levels of education (Vlasblom & Schippers, 2004).

In Kenya, Figure 1 shows that female labor force participation rate increased between 1986 and 2005/06 except for those aged 15 to 29 years. The highest participation rates are among those aged 25 to 49 years. Women who are aged 15 to 19 years have the lowest participation rates in all the three periods. The persons in this age group are mostly secondary school students (Republic of Kenya, 2003). Labor force participation rates of females aged 25 to 64 years are lower than those of males of the same age.

Figure 1: Male and Female labor force Participation rate in Kenya by age groups.
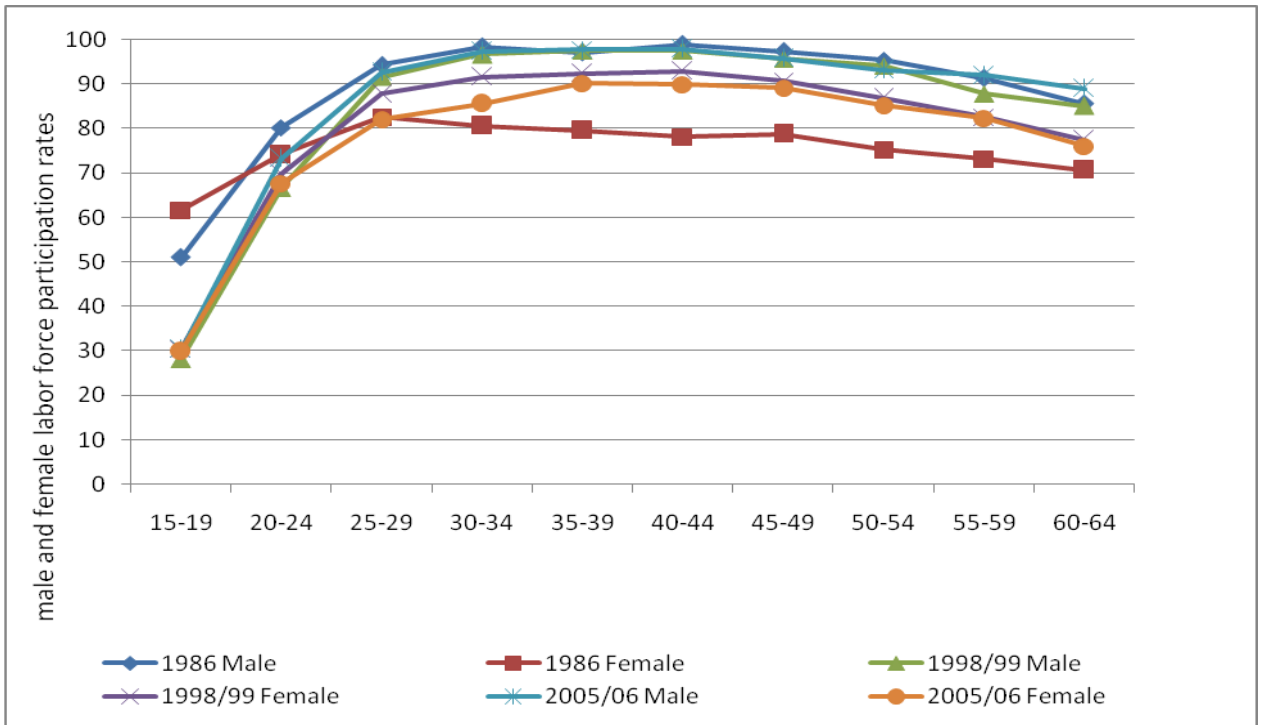
Source : Short and Wilson(1991);Republic of Kenya(2003: 2008a)

The increase in female labor force participation rates may have been caused by a variety of factors ((Vlasblom & Schippers, 2004; ILO, 2010; ILO, 2012). Availability of low cost child care centers encourages a household to outsource for child care services allowing mother's level of engagement in paid work to increase. Increased female education attainment can also increase women labor force participation. In addition change in technology may also improve women participation rates if it results to considerable reduction in time spent by women performing household chores. For example if washing machines and fridges helps to reduce time spent in washing clothes and cooking, then the probability of women participating in market work increases. Reduction in fertility can also lead to an increase in the number of women in the labor force. Other factors that have an influence in women decision to participate in the market

include accessibility to credit and productive assets, non labor income and age. This study focused on how fertility influences labor force participation in Kenya.

KDHS 2008/09 defines total fertility rate as "the average number of children a woman would have if she went through her entire reproductive period, from 15 to 49 years, reproducing at the prevailing age specific fertility rates" (KNBS & ICF Macro, 2010, page 47). It also defines age specific fertility rate as "the number of live births to women in a particular age group divided by number of persons-years lived by women in the same age group during a particular period of time"(KNBS & ICF Macro, 2010, page 47) . It is normally expressed as births per 1000 women. In Kenya, total fertility rate has declined over time (Table 1). Total fertility rate was 8.1 children per woman in the 1970's. It was among the highest in the world. This declined to 6.7 children per woman in the late 1980's. It further declined to 4.7 children per woman in the period 1995-1997. However from 1998 fertility rates started increasing and between 2000-2002 periods it stood at 4.9 children per woman followed by a decline to 4.6 children per woman in 2006 - 2008.

Table 1: Age specific fertility rates and total fertility rates in Kenya from 1975- 2008

Age Group	1975-1978	1984-1988	1990-1992	1995-1997	2000-2002	2006-2008
15-19	168	152	110	111	114	103
20-24	342	314	257	248	243	238
25-29	357	303	241	218	231	216
30-34	293	255	197	188	196	175
35-39	239	183	154	109	123	118
40-44	145	99	70	51	55	50
45-49	59	35	50	16	15	12
Total fertility rate	8.1	6.7	5.4	4.7	4.9	4.6

Source: KNBS & ICF Macro, 2010

It is clear from Table 1 that age specific fertility rates have declined for all age groups between 1984-1988 and 2006-2008.There are several factors that are responsible for decline in fertility in Kenya. These factors are increased access and use of contraceptives, attainment of better education, increase in wages and urbanization, increase in age at first marriage, availability of decent jobs and limited access to resources (KNBS & ICF Macro, 2010; Askew, Ezeh, Bongaarts & Townsend, 2009).

1.2 Problem Statement

 Women labor force participation is important for economic growth and achievement of Millennium Development Goals (Klasen, 2006). Although female labor force participation rates in Kenya have been increasing women are still underrepresented in the

labor force because their participation rates are still lower than male participation rates (Republic of Kenya, 2003: 2008a). Therefore, if this situation is not addressed it could result into increase gender inequality within the country. Various policies and interventions such as women enterprise development fund, the Constitution of Kenya and the Kenya Employment Act No. 11 of 2007 aim to increase women participation in the labor market.

One aspect that has not received much attention is the potential conflict between women as labor market participants and women as caregivers to their children. There are two views; higher fertility rate may reduce female labor force participation because less time is available to take care of children (Becker, 1965). On the other hand, higher fertility rate may increase female labor force participation to generate more resources to take care of children (Canning & Finlay, 2012)

Kenya has experienced fertility decline between 1984 and 2008, which coincides with increase in female labor force participation (KNBS & ICF Macro, 2010).This appears to be consistent with the first view. Despite this development, previous empirical studies of labor supply in Kenya (Atieno, 2006) have not specifically addressed the relationship between fertility and female labor force participation. The study seeks to fill this gap by assessing the relationship between fertility and labor force participation of women aged 15 to 49 years in Kenya. The question addressed is: does fertility increase or reduce labor force participation of women of reproductive age in Kenya?

1.3 Research Objectives

The general objective is to investigate the effect of fertility on labor force participation of women of reproductive age in Kenya. The specific Objectives are:

a) To estimate the effect of the number of children on labor force participation of women of reproductive age in Kenya.

b) To examine the difference between labor force participation of married women and single mothers in Kenya.

c) To suggest policy recommendations based on research findings.

1.4 Significance of the Study

This study estimated the effect of fertility on labor force participation of women aged 15 to 49 years in Kenya. This will inform the employment policy as the findings will assist both government and private employers in designing programmes that enhance greater female labor force participation. In addition, this study employed instrumental variable estimation method as a way of tackling endogeneity of fertility decisions. This will improve the credibility of the estimated results.The study provides additional evidence on how fertility affects female labor force participation. It will also help clear the ambiguous relationship that exists in theoretical literature between fertility and female labor supply.

1.5 Organization of the Study

The remainder of the research paper is organized as follows: Chapter two reviews both theoretical and empirical literature. Chapter three presents methodology and discusses the data. Chapter four presents the econometric results. Chapter five contains summary, conclusion of key findings of the study and policy implications.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews theoretical and empirical literature on the relationship between fertility and female labor force participation. The purpose of this review is to understand what theory predicts and what empirical evidence have established. In so doing, it will be possible to identify gaps that have not been addressed so far.

2.2 Theoretical Literature

This section reviews theories on labor supply which will be useful in identifying the factors that influence labor force participation. The individual labor supply theory argues that each individual has a limited amount of time to allocate between leisure and work (Ehrenberg & Smith, 2006). This implies that there is a tradeoff between consuming leisure and participating in work. Assuming that an individual is rational he or she chooses consumption-leisure bundle to maximize his or her utility subject to budget constraint and time constraint.

The factors that influence individual labor supply according to the model include market wage rate, non-labor income and personal preferences. Each individual is assumed to have a reservation wage. Ehrenberg & Smith (2006) defines reservation wage as the wage below which an individual will not participate in the labor force. It is determined jointly by personal preferences and non labor income. In instances where the prevailing wage rate exceeds reservation wage the individual chooses to participate in the labor force.

A change in the prevailing wage rate results into substitution and income effect. Holding all other factors constant, if wage rate increases, the opportunity cost of leisure increases. An individual will therefore substitute work for leisure. He/she will therefore increase his or her labor supply. This is referred to as substitution effect. On the other hand, an increase in wage rate increases an individual's income. This additional income enables an individual to purchase more leisure and reduce working time. This is called income effect. The total effect of an increase in wage rate on labor supply depends on which of the two effects is greater. If the income effect is greater than substitution effect then the labor supply will decrease and vice versa.

A change in non-labor income has a pure income effect. Assuming leisure is a normal good an increase in non-labor income raises reservation wage of an individual. If the increase in non-labor income raises reservation wage above market wage of an individual who is a participant, he or she will exit the labor force. For those individuals who have not yet joined the labor force, an increase in non-labor income further raises the reservation wage above the market wage. They will therefore remain out of the labor force (Ehrenberg & Smith, 2006).

Other factors can influence labor force participation. One such factor is fertility. Presence of children affects reservation wage of an individual. If children increase reservation wage above market wage an individual will not participate in the labor market. However if the market wage remains above reservation wage an individual will participate.

The theory of allocation of time by Becker (1965) argues that consumers do not derive utility directly from market goods and services. Consumers derive direct utility from basic commodities produced by a combination of both market goods and services and consumer time. A consumer therefore maximizes her utility subject to both budget and time constraint. Market goods and services are purchased by both earned and unearned income. An example of these commodities is child care which is time intensive. A woman derives utility by both working and taking care of her children. She therefore allocates the available time in such a way she gets the highest utility possible.

When the number of children increases, a woman may opt to allocate more time to paid work and hire a baby sitter to take care of the children. On the other hand she can decide to reduce use of market goods and services and do the household chores such as childrearing, cloth making and preparation of meals. In both scenarios, the factors that affect a woman's labor supply according to this theory are wage rate, non-labor income and personal preferences. A rise in wage rate generates substitution and income effect (ceteris paribus). The rise in wage rate also increases opportunity cost of time. This induces a woman to substitute market procured child care for consumer time. She will therefore increase her labor supply. This is referred to as substitution effect. An increase in wage rate also raises an individual income. This reduces labor supply. The overall effect of a wage increase on labor supply depends on which of the two effects is higher. If the income effect is less than substitution effect then labor supply will increase and vice versa.

An increase in unearned income according to Becker's model means that a household can afford more market goods and services without necessarily participating in paid work. A woman can thus increase her satisfaction by spending more time with her children. This reduces labor supply.

Gronau (1977) extended Becker's model such that women decision to participate in the labor market involves a choice between market work, household work and leisure. Presence of young children, price of market substitutes of child care and woman's potential wage rate include some of the factors that determine the trade- offs between the three uses of time. The allocation of time changes with introduction of children (or increase in the number of children).More young children often imply that more time is needed for child related activities. This result into reduction in both market work time and leisure time and an increase in time allocated to household work (ceteris paribus).The net effect of young children on allocation of time between market work and household work depends on the profitability of home production of child care. At low level of wages, working women who experience an increase in the number of children are induced to work more at home than in the market (ceteris paribus).

Price of market substitutes for child care also plays a critical role in a woman decision to participate in paid work. If the substitutes are cheap then a woman will outsource the services from the market. She will work more in the market than at home. This will increase labor supply. According to theoretical literature children have an ambiguous effect on female labor force participation.

2.3 Review of Empirical Literature

This section reviews previous research studies on the effect of fertility on female labor force participation. The literature is organized on the basis of how fertility is treated in the LFP model.

Some studies treat fertility as an exogenous variable to the labor supply decisions. Posel & Stoep (2003) use data from the 2002 general household survey and employ a probit model to investigate the relationship between fertility and labor force participation in South Africa. The results indicate that mothers taking care of their own children have a higher probability of not participating in the labor market. However, those mothers who do not stay with their children are more likely to participate in the labor force. Angrist & Evans (1998) use OLS method to estimate the effect of childbearing on labor supply in the United States. The study used data from census public use micro samples. The results indicate that an additional child affects female labor force participation negatively. Aguero & Marks (2008) used the same method as Angrist & Evans (1998) to estimate the effect of children on female labor force participation in Peru, Guatemala, Nicaragua, Columbia. Dominican Republic and Bolivia. The study used data from Demographic Health Survey. The results suggest that an additional child decreases probability of labor force participation in all the countries.

Fertility behavior may be endogenous in labor market participation equation (Iacovou, 2001).This may arise when labor force participation affects fertility decisions or due to presence of unobservable factors that affect both participation and fertility. Failure to deal

with endogeneity may lead to inconsistent parameter estimates. To address the potential problem of endogeneity, several studies have used instrumental variable estimation.

A number of studies that instrument for fertility find no evidence of inverse relationship between fertility and female labor supply. Rondinelli & Zizza (2011) use data from Bank of Italy's survey of household income and wealth 2008.They use infertility shocks as an instrumental variable and employ a probit model to investigate the relationship between number of children and labor force participation decisions of women in Italy. The results indicate that children have no causal impact on labor force participation of women.

Similarly, Solomon & Kimmel (2009) found no significant effect of fertility on labor force participation of married women. The study used husband desire for children as an instrumental variable for number of children. In the first stage, OLS was used to predict the number of children. In the second stage a probit model was used with predicted number of children among the explanatory variables. Aguero & Marks (2008) use infertility shocks to study the causal effect of children on female labor force participation using demographic health survey data from Guatemala, Peru, Colombia, Nicaragua, Bolivia and the Dominican Republic. The IV estimates indicate no significant relationship between fertility and female labor force participation.

There is considerable empirical evidence that suggests that fertility has negative effect on female labor force participation even after instrumenting for fertility. Delpiano (2008) uses multiple births to instrument for fertility in 42 developing countries. They utilize

data from demographic health surveys. The results indicate that family size has a negative impact on female labor force participation. This is observable at the time of first, third and higher birth. Bloom et al (2007) estimate the effect of fertility on female labor participation in 97 countries using abortion legislation to instrument for fertility. The study used data from ILO and World Bank WDI. They employ two stage least square estimation methods. The results reveal that an extra child reduces labor force participation of women by 10 to 15 percent among those aged 20 to 39 years. An additional child also reduces participation of women aged 40 to 49 by 5 to 10 percent.

Angrist & Evans (1998) use parental preference for mixed sibling sex composition to instrument for fertility in the United States of America. Results from two stage least square estimation method show that a third child decreases the probability of working by 17 percent for both married and unmarried women. Rosenbloom et al (1999) examine the impact of unanticipated births on married women labor force participation in USA using occurrence of twin births as a source of exogenous variation in family size, the results reveal that unanticipated births have transitory effect on labor force participation of married women. Carrasco (2001) used panel data to estimate the effect of fertility on female labor force participation in United States of America. The study used family sex composition to instrument for fertility. Probit parameter estimates indicate that an additional child reduces the probability of female participation in the labor force by 38 percentage points. Cruces & Galiani (2007) used the same IV approach as Angrist & Evans (1998) to instrument for fertility in Argentina and Mexico. Census data and two stage least square method were employed. They also find that childbearing result to a

decline in female labor force participation by 9.7 percent and 9 percent in Argentina and Mexico respectively.Chuh & Oh (2002) rely on first child sex instead of first two children sex composition as an instrument for fertility in Korea. The study analyzed data from Korean national survey of family income and expenditure using two stage probit regressions. Having an additional child reduced the likelihood of labor force participation of married women by 27.5 percentage points.

Cristia (2006) studied the causal effect of first child on labor force participation of American women. To reduce endogeneity the study analyzed a sub sample of women who sought help at first pregnancy. Parameter estimates from linear probability model suggest that a first born child who is younger than one year reduced probability of female employment by 26.3 percentage points

Canning & Finlay (2012) focus on a sub sample of women who were not using contraceptives and had a desire for an extra child. Data from demographic health surveys were analyzed using probit model. The results of the study show that an extra child increases the probability of participation of rural women in the informal sectors in SSA.This may be because an extra child exerts more pressure on family resources necessitating the mother to participate in the labor market in order to provide the basic necessities to the new child. Some studies employ time series analysis to investigate the relationship between fertility and female labor force participation. Mohammad & Tisdell (2003) examine the relationship in Bangladesh over the period 1974-2000 while Ozgoren & Turkilmaz (2010) examine the fertility – female labor force participation link in

Turkey over the period 1968-2006. Both studies employ Johansen- Juselius Maximum Likelihood error correction modeling. Mohammad & Tisdell (2003) found that female labor force participation causes total fertility rate. On the other hand, Ozgoren & Turkilmaz (2010) found a two way causality between total fertility rate and female labor force participation rate.

Nielsen & Smyth (2006) use panel co-integration and granger causality approach to study the relationship between fertility rate and female labor force participation in G7 countries over the period from 1960 to 2004. The results reveal that total fertility rate granger causes female participation unlike in Mohammad & Tisdell (2003) where female labor force participation granger cause total fertility rate in the long run.

2.4 Conclusion

The theory of labor supply yields an ambiguous prediction concerning the effect of fertility on female labor force participation. If children increase reservation wage beyond market wage an individual will not participate in the labor market. On the other hand, if the market wage remains above reservation wage an individual will participate.

There has been a wide range of research on impact of fertility on female labor force participation. Some microeconomic studies find a negative relationship between presence of children and labor force participation (e.g. Delphiano, 2008, Angrist & Evans, 1998, Cruces & Galiani, 2003, Chuh & Oh, 2002 and Cristia, 2006). In contrast, Canning & Finlay (2012) find a positive effect of children on female labor force participation. Other

studies (e.g Solomon & Kimmel, 2009, Aguero & Marks, 2008 and Rondinelli & Zizza, 2011) do not find a significant relationship when they instrument for fertility.

A major challenge in estimating the effect of fertility on female labor force participation is endogeneity of fertility. OLS estimates have been found to be inefficient and standard errors are biased resulting in incorrect test statistics if fertility is treated as exogenous (Long, 1997). Some of the variables used to instrument for fertility include husband desire for more children, twin births, multiple births, parental preference for same sex sibling, first child sex and infertility shocks. This study extends the literature on labor force participation in Kenya by providing additional evidence on how fertility affects female labor force participation among women aged 15-49 years.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This chapter presents a theoretical framework used to model individual labor force participation decisions. It also discusses the econometric model employed to analyze the data.

3.1 Theoretical Model

This study adopts the neoclassical labor supply theory. For the purpose of this analysis, the assumption is that there are only two ways in which an individual can spend his or her time that is either in work or in leisure. An individual derives direct utility from leisure. Leisure includes all non-market activities. On the other hand, work provides the individual with income that enables her to purchase goods and services that generate utility.

The individual maximizes utility derived from consumption of goods and services , children and leisure subject a budget constraint and a time constraint .The utility function for this particular individual can be expressed as;

$$U = U (C, L, F; X, \varepsilon) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (1)$$

Where C is consumption of goods and services, L is hours spent on leisure; F is number of children, X represents individual woman's characteristics (observable) and ε is unobservable characteristics.

The budget constraint is represented by

$$P_F F + P_C C = WH + M \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \ (2)$$

W is the market wage rate, P_F is the price of children, P_C is the price of goods, WH is labor income and M is non-labor income.

The time constraint is $T = L + H \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \ (3)$

Where T is total time available to an individual, L is hours of leisure and H are hours an individual has worked.

From equation (3) $H = T - L$. Substituting this into equation (2) yields full income constraint

$$WL + P_F F + P_C C = WT + M \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \ (4)$$

The woman maximizes utility function (1) subject to the full income constraint (4).

Solving the utility maximizing problem yields demand functions for leisure, children and consumption which are as follows;

$$L^* = L \ (W, P_F, PC, M) \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \ (5)$$

$$F^* = F \ (W, P_F, PC, M) \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \ (6)$$

$$C^* = C \ (W, P_F, PC, M) \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \dots \ (7)$$

3.2 Econometric Model and Estimation Procedure

From the discussion in section (3.1) labor force participation decision is a function of variables that influence market wage and reservation wage such as non-labor income, price of children and price of consumption. The aim of this paper is to estimate the effect of the number of children on labor force participation of women aged 15 to 49 years in Kenya.

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Assume a woman propensity to be in the labor market, P_i^* is a function of a vector of individual household and location characteristics (Z) and number of children (F). P_i is the observed binary labor market participation decision. The model can be written as follows:

$P_i^* = Z'_i\beta + \alpha F_i + \varepsilon_i$

$P_i = 1$ if $P_i^* > 0$ and $P_i^* = 0$ otherwise

Where Z is includes age, level of education of the woman, marital status, area of residence, region of residence, wealth index, access to health services and religion. ε_i is the error term.

Fertility is potentially endogenous in labor supply decisions (Iacovou, 2001). F is endogenous if ε and μ are correlated. This arises if labor force participation also affects fertility decision with respect to having additional children.Endogeneity can also be caused by presence of unobservable factors that affect both fertility and labor force participation. To address the potential endogeneity of fertility in female labor force participation, the study estimated an instrumental variable probit regression model. The first stage equation that links potentially endogenous fertility to its determinants including the instruments is

$F_i = Z'_i\gamma + \delta D'_i + \mu_i$

Where Z is the vector of individual, household and location characteristics included in the labor force participation equation, D is a vector of instruments for fertility and μ_i is the error term.

3.3 Data and Definition of Variables

This study used secondary data from Kenya Demographic Health Survey 2008/09 (KNBS & ICF Macro, 2010). This survey was conducted by Kenya National Bureau of Statistics (KNBS).

The survey was based on a household and a representative sample of 10,000 households which was drawn from population residing in the households in the country. Three questionnaires were used to collect the data namely: women's, men's and household questionnaires.

The survey covered the entire country and collected information on demographic and health issues from a sample of women at the childbearing age of 15 to 49. It also collected information from a sample of men of age 15 to 54. This study focused on all women of reproductive age.

Table 2 gives the definitions of the variables used in the labor force participation and fertility equations.

Table 2: Definition of Variables used in the model

Variable Name	Variable Definition
Dependent Variable	
Woman in labor force	1 if she worked for the last seven days or did not work but was absent from job or business: 0 otherwise
Children born and alive	Number of children born and living
Age of a woman	Completed years
Age of a woman at first birth	Completed years
Level of woman's education	
No education	1 if a woman has no education, 0 otherwise
Primary education	1 if a woman has primary education , 0 otherwise
Secondary education	1 if a woman has secondary education, 0 otherwise
Higher education	1 if a woman has higher education, 0 otherwise
Religion of a woman	
Roman catholic	1 if a woman is a roman catholic, 0 otherwise
Protestant	1 if a woman is a protestant, 0 otherwise
Muslim	1 if a woman is a Muslim, 0 otherwise
No religion	1 if a woman has no religion, 0 otherwise
Variable Name	**Variable Definition**
Region of residence	
Nairobi	1 if a woman resides in Nairobi, 0 otherwise
Central	1 if a woman resides in Central, 0 otherwise
Coast	1 if a woman resides in Coast, 0 otherwise
Eastern	1 if a woman resides in Eastern, 0 otherwise
Nyanza	1 if a woman resides in Nyanza, 0 otherwise
Rift Valley	1 if a woman resides in Rift Valley, 0 otherwise
Western	1 if a woman resides in Western, 0 otherwise
North Eastern	1 if a woman resides in North Eastern, 0 otherwise
Age of a woman	
15-19	1 if a woman is aged 15-19 years, 0 otherwise
20-24	1 if a woman is aged 20- 24 years, 0 otherwise
25-29	1 if a woman is aged 25-29 years, 0 otherwise
30-34	1 if a woman is aged 30-34 years, 0 otherwise
35-39	1 if a woman is aged 35- 39 years, 0 otherwise
40-44	1 if a woman is aged 40-44 years, 0 otherwise
45-49	1 if a woman is aged 45-49 years, 0 otherwise

Marital status of a woman	
Never married	1 if a woman has never married, 0 otherwise
Married	1 if a woman is married, 0 otherwise
Living together	1 if a woman is living together with a man, 0 otherwise
Widowed	1 if a woman is widowed, 0 otherwise
Divorced	1 if a woman is divorced, 0 otherwise
Place of residence	
Rural	1 if a woman resides in a rural
Urban	1 if a woman resides in an urban area
Children under 5 year	Number of children who are less 5 years old

Education of woman

In the literature, education is expected to increase participation in the labor force. Education is viewed as an investment in human capital. High education results into higher wages from work which increases the opportunity cost of leisure (Kaufman & Hotchkiss, 2003). Becker (1981) argues that education may also increase female labor force participation by increasing the opportunity cost of child bearing.

The study included four categorical education dummy variables in the model namely; no education, primary education, secondary education and higher education. This will help capture the effect of different level of education attainment on female labor force participation.

Age of woman

The study developed seven categorical age dummy variables. This will capture the effect of different age groups on female labor force participation. Age is expected to influence labor force participation positively. A concave relationship between age and female labor force participation is expected. As age of a woman increases it is expected that she acquires more experience which may result in higher wages leading to an increase in labor force participation.

Number of children born and living

According to Becker (1965) women bear a higher burden compared to men in regard to childbearing and childcare. Therefore a reduction in the number of children born and living relieves women from taking care of children and other household chores and may increase their labor force participation. Children are thus expected to be negatively related to female labor force participation. On the other hand children may increase the reservation wage of a woman above the market wage reducing her labor force participation (Ehrenberg & Smith, 2006).

Marital status of woman

The study developed six categorical marital status dummy variables; never married, married, living together, widowed and divorced. Becker (1973) argues that the relationship between marital status and participation in the labor force is ambiguous.

On one hand, it is expected that a married woman is less likely to participate in the labor force if her husband is working. Her husband's earnings raise her reservation wage

reducing her likelihood of participating in the labor market. On the other hand, women who are widowed or divorced are more likely to participate in the labor force to supplement the loss of income from their husbands.

Wealth index of woman's household

Wealth index is used in this study as a proxy for non-labor income. It is expected to be negatively related to participation in the labor force. It is expected that the higher the wealth in a woman's household the higher the reservation wage. This reduces the likelihood of participating in the labor force.

Region of residence

A woman's utility from work and career aspirations is likely to be influenced by culture and traditions. Some regions have conservative social norms which may reduce women participation. In other regions, social norms are liberal increasing likelihood of women participating in the labor force

Religion of woman

The study developed four categorical dummy variables; Roman Catholic, protestant, muslim and no religion. According to O'Neil & Bilgin (2013) religion may affect female labor force participation either positively or negatively. Some religions tend to encourage practices such as labor force participation that spur economic growth. Other religions tend to put a high value on women non market activities than market activities. As a

result, it is expected that the effect of religion on labor force participation will vary across religions.

Age of woman at first birth

Bratti & Cavalli (2013) argue that an increase in age at first birth is expected to influence labor force participation positively. They are of the view that delays in giving birth leads to a reduction of negative impact of fertility on female labor supply.

CHAPTER FOUR

EMPIRICAL FINDINGS

4.1 Introduction

This chapter presents the empirical results of the study. The first section presents descriptive statistics of each of the variable used in the model. The second section presents probit regression results and the interpretation of the results.

4.2 Descriptive Statistics

This section analyzes the characteristics of the sample used in the study. It describes the distribution of each variable; mean and standard deviation.

Table 3: Means and standard deviations of variables used (Sample size = 6015)

Variable	Mean	Standard Deviation
Labor force participation	0.626	0.484
Children born and living	3.332	2.144
Never married	0.085	0.278
Married	0.725	0.447
Living together	0.053	0.224
Widowed	0.057	0.232
Divorced	0.018	0.133
Not living together	0.063	0.242
Roman Catholic	0.196	0.397
Protestant	0.615	0.487
Muslim	0.162	0.368
No religion	0.027	0.163
Urban	0.284	0.451
Rural	0.716	0.451

Variables	Mean	Standard Deviation
No education	0.175	0.380
Primary education	0.546	0.498
Secondary education	0.212	0.409
Higher education	0.067	0.250
Nairobi	0.091	0.287
Central	0.117	0.321
Coast	0.138	0.345
Eastern	0.136	0.343
Nyanza	0.165	0.371
Rift Valley	0.159	0.366
Western	0.124	0.329
North Eastern	0.071	0.257
15-19	0.050	0.217
20-24	0.190	0.392
25-29	0.204	0.403
30-34	0.184	0.388
35-39	0.146	0.353
40-44	0.117	0.321
45-49	0.108	0.311
Wealth index	3.113	1.494
Age at first birth	19.198	3.684
Children under 5 years of age	1.230	1.044

Source: Own computations from Kenya Demographic Health Survey 2008/09

From the descriptive statistics, 5% of the women sampled were aged below 20 years whereas 55.5% were 30 years and above. About 62.6% of these women were working while 37.4 % were not working. The percentage of women who lived in rural areas stood at 71.6 % while 28.4 % lived in urban areas.

About 72.5% of the sampled women were married, 8.5% were never married whereas 19% were either living together, widowed, divorced or not living together with their husbands. Religion was classified into Roman Catholic, Protestant, Muslim, no religion and others. Majority of the sampled women (61.5%) were Protestant, 19.6% were Roman Catholics, 16.2% were Muslims and 2.7% had no religion.

A notable proportion (17.5%) of the women interviewed had no education, 54.6 % had primary education, 21.2 % had secondary education, and 6.7 % had higher education. Majority of the women had primary education. About 27.9 % of the women had more than primary education.

The number of women sampled was almost evenly distributed among all the regions except North Eastern which had the smallest percentage of 7.1 %. Nyanza had the highest percentage of 16.5 % followed closely by Rift Valley with a percentage of 15.9 %. Central, Western, Coast, Eastern, and Nairobi had a percentage of 11.7 %, 12.4 %, 13.8 %, 13.6 % and 9.1 % respectively.

4.3 Econometric Results

The study estimated the probability of women participation in labor force in Kenya. The dependent variable is coded 1 if a woman worked for the last seven days or did not work but was absent from job or business and zero otherwise. Given that fertility is potentially endogenous in labor supply decisions this study used IV approach. Different sets of instrumental variables were used which included sibling sex composition, first child sex, cost of accessing health services and transport accessibility to the health facilities. Some

of these instruments that is sibling sex composition and first child sex have been used in previous studies reviewed.

Table 4 presents tests of the relevance and validity of the instruments. First, the IVs were included in the reduced form equation to test whether the IVs were relevant (strongly correlated with fertility). Second, to test whether the IVs were valid (do not explain LFP) the IVs were directly included in the structural equation.

Table 4: Tests of relevance and validity of instruments

Instrumental Variable(s)	Reduced form equation	Structural equation
Sibling sex composition	t = - 0.57 p value = 0.571	Z= -0.13 p value =0.898
Sibling sex composition First child sex	F (2, 5668) = 0.89 P value = 0.4095	$\chi2(2) = 0.85$ p value = 0.6522
Sibling sex composition, cost of accessing health services, transport accessibility to the health facilities	F(4, 1986) = 1.68 p value = 0.1519	$\chi2(2) = 4.44$ p value = 0.3500

Source: Computation from KDHS 2008/09 data

For all sets of IVs the p-values of test statistics based on reduced form equation are greater than 0.05. This implies that in this data set the instruments are uncorrelated with fertility and they are therefore weak. The F statistics are also less than 10 in the case of multiple instruments indicating that the IVs are not strongly correlated with fertility. In the LFP equation the p values are greater than significance level of 0.05 which implies

that the null hypothesis that instruments are valid may not be rejected. The IVs do not directly explain LFP.

Due to lack of suitable instruments the study focused on parameter estimates of the probit model. IV results are in Appendix. Probit coefficients cannot be interpreted directly. As a result marginal effects have to be computed from probit results. Marginal effect is the change in the predicted probability resulting from a change in independent variable. The marginal effects of labor force participation of women aged 15-49 years in Kenya are presented in Table 5.

Table 5: Estimates of Labor Force Participation Equation

Probit results and marginal effects				
Variables	**Coefficients**	**Z**	**P- value**	**Marginal effects**
Children born and living	0.173	3.06	0.002	0.066
Marital status of the woman				
Never married	-0.252	-2.57	0.010	-0.097
Married	-0.424	-5.42	0.000	-0.152
Living together	-0.592	-5.47	0.000	-0.232
Widowed	-0.162	-1.45	0.148	-0.062
Divorced	0.044	0.27	0.785	0.016
Religion				
Protestant	0.080	1.70	0.089	0.029
Muslim	-0.287	-3.69	0.000	-0.110
No religion	0.331	2.80	0.005	0.116
Place of residence				
Urban	-0.055	-0.93	0.353	-0.021
Woman's level of education				
Primary education	0.310	5.03	0.000	0.116
Secondary education	0.391	5.28	0.000	0.139
Higher education	0.781	7.48	0.000	0.242

Region				
Central	0.405	4.44	0.000	0.141
Coast	0.044	0.52	0.603	0.016
Eastern	0.040	0.45	0.650	0.015
Nyanza	0.501	5.85	0.000	0.173
Rift Valley	0.189	2.23	0.026	0.069
Western	0.036	0.42	0.677	0.013
North Eastern	-0.555	-4.54	0.000	-0.217
Age interval				
20-24	0.479	5.24	0.000	0.167
25-29	0.776	7.99	0.000	0.257
30-34	1.021	9.96	0.000	0.316
35-39	1.001	9.33	0.000	0.304
40-44	1.120	9.86	0.000	0.322
45-49	1.037	8.96	0.000	0.304
Age at first birth	-0.013	-2.26	0.024	-0.005
Children under 5 years	-0.083	-4.21	0.000	-0.031
Wealth index	0.046	2.5	0.012	-0.017
Constant	-0.464	-2.61	0.009	
Log likelihood				-3406.5597
$\chi^2(29)$				1140.75
P-value				0.000
Psuedo R^2				0.1434
Sample Size				6015

Source: Computation from KDHS 2008/09 data

Notes

Reference group of marital status is not living together

Reference group of religion is Roman Catholic

Reference group for residence is rural residence

Reference group for level of education is no education

Reference group for region is Nairobi

Reference group for age interval is 15-19 years

The results show that age of a woman at first birth is a determinant of labor force participation of women of reproductive age in Kenya. The marginal effect of age at first birth is -0.005 and is statistically significant at 5% level. Therefore a woman is 0.5 percentage points less likely to participate in the labor force if her age at first birth increases by one year. This is contrary to priori expectations that the older the woman at first birth the greater the probability of labor force participation. The negative relationship may arise when a woman spend much time on acquiring more education which delays both entry into labor force and motherhood (Becker, 1964).

Theoretically the effect of fertility on labor force participation of women is not clear. The estimation results indicate that the number of children born and living is positively related to women participation in the labor market. The marginal effect of children is 0.066 which and statistically significant at 1% level. This implies that the probability of a woman participating in the labor force increases by 6.6 percentage points when an additional child is born. The positive relationship may be because an extra child exerts more pressure on family resources necessitating the mother to join the labor market to provide for the basic necessities to the new child.

The number of children under 5 years in the family has significant negative effect on female labor force participation in Kenya. An increase in the number of children under 5 years by one reduces the probability of a woman participating in the labor force by 3.1 percentage points. The observed results may arise if a woman prefers raising her own children. Thus an additional child will necessitate a woman to allocate more time to child care which in turn reduces her chances of participation in the labor market.

Marital status of the woman was considered as a variable that may have effect on women participation in the labor market. Women who are married are 15.2 percentage points less likely to participate in the labor force than those women who are not living together with their husbands. The marginal effects for women who have never married and those living together with their partners is -0.097 and – 0.232 respectively. They are statistically significant at 1% level. Therefore women who are not living together with their partners are 9.7 and 23.2 percentage points more likely to be in the labor force than those women who have never married and living together respectively. Married women are less likely to participate in the labor force if their husband's income raises their reservation wage reducing their likelihood of participating in the labor market. On the other hand, women who are not living together with their spouses are more likely to participate in the labor force to supplement the loss of income from their husbands.

Religion has mixed effects (positive and negative) on women participation in the labor force. Muslim women are 11 percentage points less likely to be in the labor force than those who are Roman Catholics. The marginal effect is statistically significant at 1% level. The marginal effect of women with no religion is 0.116 and statistically significant at 1%. The probability of a woman without any religion participating in the labor market is 11.6 percentage points higher compared to a Roman Catholic woman. This conforms to priori expectations that the effect of religion will vary across religions. O'Neil & Bilgin (2013) argue that the varying effect of religion on LFP may occur when some religions encourage practices that spur economic growth such as labor force participation while others put high value on women non market activities than market activities.

Education and labor force participation are positively related. An increase in the level of a woman's education increases her participation in the labor force. The marginal effects of primary, secondary and higher education are 0.116, 0.139 and 0.242 respectively and are statistically significant at 1% level. This implies that the probability of women with primary education participating in labor market is 11.6 percentage points higher compared to women with no education. The probability of women with secondary and higher education being in the labor force is 13.9 and 24 percentage points higher respectively compared to that of women with no education. Higher educational attainment increases chances of participation. Increased education increases opportunity cost of non-market work and also assists in promoting unbiased gender attitudes.

Region is either positively or negatively related to women participation in the labor market. Women residing in North Eastern are 21.7 percentage points less likely to join labor force than women residing in Nairobi. The marginal effects for Nyanza, Rift Valley and Central region are 0.173, 0.069 and 0.141 respectively and are statistically significant at 1%, 5% and 1% level respectively. Therefore women from Nyanza, Rift Valley and Central are 17.3 %, 6.9 % and 14.1 percentage points respectively more likely to participate in the labor force compared to those in Nairobi. The observed negative results in North Eastern may arise if women in this region value non market activities more than market activities.

Women aged 20-24 years are 16.7 percentage points more likely to join labor force than women aged 15-19 years. The marginal effects of women aged 25-29 and 30-34 is 0.257 and 0.316 respectively and are statistically significant at 1 % level. The probability of

women aged 25-29 participating in the labor force is 25.7 percentage points higher compared to that of women who are 15-19 years. The probability of woman aged 30-34 years is also higher by 31.6 percentage points compared to that of woman who is between 15 and 19 years. The positive relationship may arise when a woman gains more experience and attains higher level of education as she grows older. The higher level of education and experience allows her to earn a higher wage which increases her chances of participating in the labor force.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND POLICY IMPLICATION

5.1 Introduction

This chapter presents summary, conclusion and policy implications of the study .It is divided into three sections, the first section presents summary and conclusion of the study, the second present policy implications while the third suggests topics of future research.

5.2 Summary and Conclusions

Women are underrepresented in the labor force in Kenya as their participations rates are lower than male participation rates. This gender gap in the labor force can increase gender inequality if not addressed which makes it an issue of policy concern. This study investigated the effect of fertility on labor force participation of women of reproductive age in Kenya, based on the 2008/09 Kenya Demographic Health Survey data.

Because fertility is potentially endogenous in LFP equation an attempt was made to instrument for fertility. However the instrumental variables used were found to be weak. Therefore, the study employed a probit model which was estimated using maximum likelihood method. The results show that age, age at first birth, number of young children under 5 years, number of children born and living, marital status dummies, religion dummies and regional dummies affect labor force participation of women aged 15-49 years in Kenya.

Education level of a woman is positively related to participation in the labor force. The results show that women with primary, secondary and higher education attainment have higher chances of joining the labor market compared to those with no education. The probability of participation increases with the level of education of a woman.

The number of children born and living exerts a positive influence on labor force participation of a woman. As the number of children increase the probability of participation in the labor force also increases. This is consistent with the results of Canning and Finlay (2012) who found the existence of a positive relationship between number of children and female labor supply. The number of children under 5 years affects labor force participation of women in Kenya negatively. The estimated results show that an increase in the number of children under 5 years reduces the probability of women joining the labor force. These findings are similar to those of Posel and Stoep (2003) who found that mothers taking care of their own children have lower chances of participating in the labor force.

Age and female labor force participation are positively related. The empirical results indicate that a woman's probability of participating in the labor force increases with her age. In contrast, the probability of a woman participating in the labor market tends to decrease with increase of age at first birth. Marital status may positively or negatively relate to participation of women in the labor force. The results show that woman who are married are less likely to participate in the labor force compared those women who are not living together with their husbands. Women who are not living together with their

spouses are more likely to be in the labor force compared to women who have never married. Religion also exerts effect on women decision to participate in the labor market. The effect varies across various religions and it may be positive or negative. Women who are Muslims are less likely to participate in the labor force relative to women who are Roman Catholics. Women without any religion are more likely to join the labor force compared to Roman Catholics. The effect of region on female labor force participation of women is varied (positive and negative).The results indicate that being a residence in north eastern of Kenya reduces the probability of a woman participating in the labor force.

5.2 Policy Implication

In Kenya the number of women participating in the labor force is still low compared to men. This could be as result of lack of required education qualifications. Women access to educational opportunities and well-paying jobs reduces the probability of household poverty. School fees and other monetary costs associated with schooling hinder access to education (Holla & Kremer, 2008). In particular, a girl schooling is sensitive to school fees being charged (Alderman & King, 1998). Empirical evidence show that labor force participation is higher among women who are educated. The government should therefore strengthen the bursary and the scholarship programme, provide more funds to the Higher Education loans Board and should target these resources to girls who are needy and bright. This will help raise the level of educational attainment of the women. Children who are less than 5 years old hinder women from participating in the labor force. In addition, marriage also has a negative effect on labor force participation of

women of reproductive age. High cost of childcare services discourages households from hiring formal child care services (Lokshin et al, 2000). Therefore, policies that aim at freeing much of women's time should be pursued. This could be done by putting up preschool facilities, subsidizing childcare and improving women accessibility to time saving technologies such use of washing machines. This would assist in reducing the burden of household chores on women.

Age exerts a positive influence on labor force participation of women in Kenya. It is a proxy for experience and wage rate. The probability of women being in the labor force increases with age. The government should thus promote vacation work and internships among the young women. This will help them to acquire experience and have a good start in their career.

There should be rolling out of sensitization programmes through mass media, seminars and workshops to regions like North Eastern where women are still confined to their traditional roles such as child care. This will assist in providing information to women in these areas on the benefits of female labor force participation which include economic empowerment, economic growth and reduction in gender inequality.

5.3 Implication for Further Research

The main focus of this study was on how fertility affects female labor force participation in Kenya. It is thus important for future studies to explore other areas such as effects of schooling and population policies on fertility and female labor force participation in Kenya. Labor supply of women in urban and rural areas may differ. Thus there is need for deeper analysis to establish if disparities exist between labor force participation of women in urban and rural areas.

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APPENDICES

Table A1: Labor Force Participation Rates by Age and Sex in Kenya

Age Group	1986			1998/99			2005/06		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
15-19	51	61.6	56.4	28.1	30.5	29.3	30.3	29.9	30.1
20-24	80.2	74.1	77.3	66.6	69.8	68.3	73.2	67.6	70.2
25-29	94.3	82.5	88.8	91.5	87.7	89.4	92.6	82.0	87.0
30-34	98.3	80.6	90.4	96.6	91.6	94.1	97.3	85.5	91.5
35-39	97.1	79.6	89.6	97.4	92.3	94.8	97.7	90.1	93.7
40-44	98.9	78.1	92.3	97.5	92.9	95.2	97.9	89.9	93.7
45-49	97.3	78.8	91.2	95.6	90.7	93.4	95.8	89.1	92.5
50-54	95.4	75.3	89.2	94.0	86.9	90.3	93.1	85.2	89.2
55-59	91.3	73.1	85.0	87.8	82.5	85.1	91.9	82.3	87.2
60-64	85.6	70.7	78.2	85.0	77.4	80.9	88.9	76.0	82

Source: Integrated Labor Force Surveys 2005/06

Table A2: Probit Regression Results

Probit regression				No of obs	=	6015
				LR chi2(29)	=	1140.75
				prob > chi2	=	0.0000
Log likelihood = -3409.9752				Pseudo R2	=	0.1434

Labor force participation	coeff	Std. Err.	z	p>z	[95% Conf.	Interval]
Children born and living	0.1725527	0.056452	3.06	0.002	0.06191	0.2831958
Never married	-0.2518694	0.098191	-2.57	0.010	-0.44432	-0.059418
Married	-0.4244402	0.078347	-5.42	0.000	-0.578	-0.2708822
Living together	-0.5915713	0.108163	-5.47	0.000	-0.80357	-0.3795756
Widowed	-0.1622407	0.112032	-1.45	0.148	-0.38182	0.0573383
Divorced	0.0437243	0.160223	0.27	0.785	-0.27031	0.3577561
Protestant	0.0779942	0.045815	1.7	0.089	-0.0118	0.1677898
Muslim	-0.286976	0.077694	-3.69	0.000	-0.43925	-0.1346992
No religion	0.3312376	0.11817	2.8	0.005	0.099629	0.5628467
Urban residence	-0.0552257	0.059501	-0.93	0.353	-0.17185	0.0613944
Primary education	0.309717	0.061598	5.03	0.000	0.188988	0.4304461
Secondary education	0.3913	0.074137	5.28	0.000	0.245994	0.5366063
Higher education	0.7805684	0.104362	7.48	0.000	0.576022	0.9851149
Central	0.4045574	0.091177	4.44	0.000	0.225853	0.5832616
Coast	0.043792	0.084295	0.52	0.603	-0.12142	0.209007
Eastern	0.0400737	0.088223	0.45	0.650	-0.13284	0.2129867
Nyanza	0.5006286	0.085532	5.85	0.000	0.33299	0.6682675
Rift valley	0.1888909	0.084865	2.23	0.026	0.022558	0.3552237
Western	0.0357301	0.085748	0.42	0.677	-0.13233	0.203792
North eastern	-0.5551324	0.122249	-4.54	0.000	-0.79474	-0.3155295
20-24	0.4786715	0.091305	5.24	0.000	0.299716	0.6576267
25-29	0.776156	0.097097	7.99	0.000	0.58585	0.9664619
30-34	1.021544	0.102575	9.96	0.000	0.820502	1.222587
35-39	1.000705	0.10724	9.33	0.000	0.790518	1.210891
40-44	1.119859	0.11363	9.86	0.000	0.897149	1.34257
45-49	1.037471	0.115807	8.96	0.000	0.810493	1.264449
Age at first birth	-0.0129882	0.00574	-2.26	0.024	-0.02424	-0.0017381
Children under 5 years	-0.0833371	0.019778	-4.21	0.000	-0.1221	-0.0445727
Wealth index	0.0455182	0.018223	2.5	0.012	0.009802	0.081234
Constant	-0.4641641	0.178174	-2.61	0.009	-0.81338	-0.1149493

Table A3: Probit Marginal Effects

Number of obs   = 6015
LR chi2 (29)   = 1140.75
Prob > chi2   = 0.0000
Log likelihood = - 3406.5597   Pseudo R2   = 0. 1434

Labor force participation	dF/dx	Std. Err.	z	P>z	x-bar	[95%	C.I.]
Children born and living	0.0656099	0.0217297	3.06	0.002	0.782211	0.02302	0.108199
Never married	-0.0971406	0.0386603	-2.57	0.010	0.084456	-0.172913	-0.021368
Married	-0.1520901	0.0265293	-5.42	0.000	0.724522	-0.204087	-0.100094
Living together	-0.2316789	0.0421247	-5.47	0.000	0.0532	-0.314242	-0.149116
Widowed	-0.0621188	0.0436776	-1.45	0.148	0.057024	-0.147725	0.023488
Divorced	0.0162514	0.0590726	0.27	0.785	0.018121	-0.099529	0.132031
Protestant	0.0293004	0.017256	1.70	0.089	0.614963	-0.004521	0.063121
Muslim	-0.1103884	0.0304462	-3.69	0.000	0.161596	-0.170062	-0.050715
No religion	0.1155449	0.0376776	2.80	0.005	0.027265	0.041698	0.189392
Urban	-0.0207702	0.0224636	-0.93	0.353	0.284289	-0.064798	0.023258
Primary education	0.1161786	0.0230644	5.03	0.000	0.545968	0.070973	0.161384
Secondary edution	0.1392291	0.0247572	5.28	0.000	0.211638	0.090706	0.187752
Higher education	0.2417124	0.0243083	7.48	0.000	0.066999	0.194069	0.289356
Central	0.1409958	0.0289628	4.44	0.000	0.116708	0.08423	0.197762
Coast	0.0163082	0.0312035	0.52	0.603	0.137656	-0.04485	0.077466
Eastern	0.0149307	0.0326889	0.45	0.65	0.135827	-0.049138	0.079
Nyanza	0.1729151	0.026554	5.85	0.000	0.165254	0.12087	0.22496
Rift Valley	0.0689267	0.0300581	2.23	0.026	0.158936	0.010014	0.127839
Western	0.0133182	0.0318011	0.42	0.677	0.123857	-0.049011	0.075647
North Eastern	-0.2172045	0.0479501	-4.54	0.000	0.070989	-0.311185	-0.123224
20-24	0.1670519	0.0291398	5.24	0.000	0.190191	0.109939	0.224165
25-29	0.2567763	0.0271235	7.99	0.000	0.204489	0.203615	0.309937
30-34	0.3164075	0.0241581	9.96	0.000	0.184206	0.269059	0.363757
35-39	0.3041058	0.0239629	9.33	0.000	0.146301	0.257139	0.351072
40-44	0.3218101	0.0217276	9.86	0.000	0.116708	0.279225	0.364395
45-49	0.3039073	0.0233246	8.96	0.000	0.108396	0.258192	0.349623
Age at first birth	-0.0048651	0.00215	-2.26	0.024	19.1983	-0.009079	-0.000651
Children under 5 yrs	-0.0312163	0.0074055	-4.21	0.000	1.23009	-0.045731	-0.016702
Wealth index	0.0170501	0.0068248	2.50	0.012	3.11338	0.003674	0.030426

Table A4: Instrumental variable probit regression results

Number of obs = 5699

Wald chi2 (29) = 1752.83

Log likelihood = - 12676.931

prob > chi2   = 0.0000

Labor force participation	Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
Children born and living	0.5178966	0.3995654	1.30	0.195	-0.2652371	1.30103
Never married	-0.1119112	0.2012781	-0.56	0.578	-0.5064091	0.2825867
Married	-0.5518658	0.0768229	-7.18	0.000	-0.702436	-0.4012956
Living together	-0.5606678	0.1832716	-3.06	0.002	-0.9198736	-0.2014621
Widowed	-0.2287954	0.1067246	-2.14	0.032	-0.4379717	-0.0196192
Divorced	0.1907415	0.1554332	1.23	0.22	-0.113902	0.4953851
Protestant	0.0506229	0.0621949	0.81	0.416	-0.0712769	0.1725226
Muslim	-0.2411343	0.1437847	-1.68	0.094	-0.5229472	0.0406786
No religion	0.3716915	0.109328	3.40	0.001	0.1574124	0.5859705
Urban	-0.0456365	0.0772338	-0.59	0.555	-0.197012	0.105739
Primary education	0.3158036	0.0817763	3.86	0.000	0.155525	0.4760822
Secondary edution	0.4726504	0.0695229	6.80	0.000	0.3363879	0.6089128
Higher education	0.7647353	0.2069564	3.70	0.000	0.3591082	1.170362
Central	0.3054123	0.1612854	1.89	0.058	-0.0107012	0.6215259
Coast	0.0074948	0.0913021	0.08	0.935	-0.1714539	0.1864436
Eastern	-0.0453625	0.0928758	-0.49	0.625	-0.2273957	0.1366706
Nyanza	0.3150127	0.2561805	1.23	0.219	-0.1870919	0.8171174
Rift Valley	-0.1272223	0.2700497	-0.47	0.638	-0.65651	0.4020654
Western	-0.0830334	0.1125424	-0.74	0.461	-0.3036125	0.1375458
North Eastern	-0.6425078	0.1312373	-4.90	0.000	-0.8997281	-0.3852875
20-24	-0.0135713	0.5954519	-0.020	0.982	-1.180636	1.153493
25-29	-0.3423863	1.183822	-0.290	0.772	-2.662635	1.977862
30-34	-0.739293	1.76644	-0.420	0.676	-4.201452	2.722866
35-39	-1.298479	2.181493	-0.60	0.552	-5.574126	2.977168
40-44	-1.455931	2.444611	-0.60	0.551	-6.247279	3.335418
45-49	-1.920947	2.725902	-0.70	0.481	-7.263616	3.421722
Age at first birth	0.094723	0.0303819	3.12	0.002	0.0351756	0.1542703
Children under 5 years	0.0831926	0.0829416	1.00	0.316	-0.0793699	0.2457551
Wealth index	-0.3920056	0.2350337	-1.67	0.095	-0.8526631	0.068652
Constant	-1.969313	1.153496	-1.71	0.088	-4.230123	0.2914982

Table A4 contd

	Coeff	Std. Err	Z	P >z	(95% conf.	Interval)
Children born and living						
Never married	-0.1524115	0.0913454	-1.67	0.095	-0.3314452	0.0266221
Married	0.5186187	0.0711808	7.29	0.000	0.3791068	0.6581305
Living together	0.2683897	0.1016645	2.64	0.008	0.069131	0.4676484
Widowed	0.2478594	0.1006032	2.46	0.014	0.0506807	0.4450382
Divorced	-0.2558932	0.1418427	-1.8	0.071	-0.5338998	0.0221134
Protestant	0.0201582	0.044014	0.46	0.647	-0.0661077	0.106424
Muslim	0.0346341	0.0782067	0.44	0.658	-0.1186483	0.1879164
No religion	-0.3213141	0.1177774	-2.73	0.006	-0.5521535	-0.0904747
Urban	-0.0361613	0.0567144	-0.64	0.524	-0.1473194	0.0749969
Primary education	-0.1917814	0.0611823	-3.13	0.002	-0.3116964	-0.0718664
Secondary edution	-0.3914153	0.0727688	-5.38	0.000	-0.5340394	-0.2487911
Higher education	-0.4036527	0.0967673	-4.17	0.000	-0.5933131	-0.2139923
Central	-0.0700838	0.0858919	-0.82	0.415	-0.2384288	0.0982613
Coast	0.0600873	0.0832744	0.72	0.471	-0.1031275	0.2233021
Eastern	0.1024246	0.0855059	1.2	0.231	-0.0651639	0.2700131
Nyanza	0.0677493	0.0810648	0.84	0.403	-0.0911349	0.2266334
Rift Valley	0.4697124	0.0816228	5.75	0.000	0.3097346	0.6296901
Western	0.1841817	0.083426	2.21	0.027	0.0206697	0.3476938
North Eastern	0.4597569	0.1178156	3.9	0.000	0.2288425	0.6906713
20-24	0.8280439	0.0880199	9.41	0.000	0.6555281	1.00056
25-29	1.9308	0.088821	21.74	0.000	1.756714	2.104886
30-34	3.081634	0.0908586	33.92	0.000	2.903555	3.259714
35-39	4.141334	0.0937495	44.17	0.000	3.957588	4.325079
40-44	4.63967	0.0976323	47.52	0.000	4.448315	4.831026
45-49	5.430965	0.1000114	54.3	0.000	5.234946	5.626984
Wealth index	-0.1166918	0.0174341	-6.69	0.000	-0.150862	-0.0825216
Age at first birth	-0.1863813	0.0052535	-35.48	0.000	-0.1966781	-0.1760846
Children under 5 yrs	0.6629876	0.018256	36.32	0.000	0.6272065	0.6987686
First child sex	0.0424087	0.0325397	1.30	0.192	-0.0213679	0.1061853
Sibling sex composition	-0.0157408	0.0297376	-0.53	0.597	-0.0740255	0.0425439
Constant	3.263385	0.1712824	19.05	0.000	2.927678	3.599092

test   Sibling sex composition first child sex

1. Sibling sex composition = 0
2. First child sex = 0

F(2, 5668) =   0.89

Prob > F =   0.4095

Table A5: Instrumental variable probit regression results

<div align="right">

Number of obs = 5699

Wald chi2 (29)   = 988.56

</div>

Log likelihood = - 12678.063   Prob > chi2   = 0.0000

	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Children born and living	0.210896	1.674229	0.13	0.900	-3.07053	3.492324
Never married	-0.217054	0.439157	-0.49	0.621	-1.07779	0.643678
Married	-0.478401	0.620148	-0.77	0.440	-1.69387	0.737068
Living together	-0.605071	0.133194	-4.54	0.000	-0.86613	-0.34402
Widowed	-0.182392	0.34586	-0.53	0.598	-0.86026	0.495481
Divorced	0.130947	0.406293	0.32	0.747	-0.66537	0.927268
Protestant	0.07523	0.099567	0.76	0.450	-0.11992	0.270377
Muslim	-0.297239	0.159335	-1.87	0.062	-0.60953	0.015052
No religion	0.334595	0.375977	0.89	0.374	-0.40231	1.071497
Urban	-0.076447	0.13412	-0.57	0.569	-0.33932	0.186424
Primary education	0.322557	0.141866	2.27	0.023	0.044505	0.60061
Secondary education	0.434246	0.419922	1.03	0.301	-0.38879	1.257277
Higher education	0.807865	0.210033	3.85	0.000	0.396208	1.219522
Central	0.364372	0.150691	2.42	0.016	0.069023	0.659721
Coast	0.036801	0.157153	0.23	0.815	-0.27121	0.344814
Eastern	-0.011708	0.198629	-0.06	0.953	-0.40101	0.377597
Nyanza	0.440945	0.431481	1.02	0.307	-0.40474	1.286632
Rift Valley	0.051241	0.890456	0.06	0.954	-1.69402	1.796503
Western	-0.023408	0.328501	-0.07	0.943	-0.66726	0.620442
North Eastern	-0.622124	0.433674	-1.43	0.151	-1.47211	0.227861
20-24	0.366231	1.759673	0.21	0.835	-3.08267	3.815128
25-29	0.448994	3.820319	0.12	0.906	-7.03869	7.936681
30-34	0.465184	5.923622	0.08	0.937	-11.1449	12.07527
35-39	0.227163	7.68352	0.03	0.976	-14.8323	15.28658
40-44	0.253964	8.612091	0.03	0.976	-16.6254	17.13335
45-49	0.015098	9.885574	0	0.999	-19.3603	19.39047
Age at first birth	0.021943	0.324026	0.07	0.946	-0.61314	0.657023
Children under 5 yrs	-0.203292	1.066038	-0.19	0.849	-2.29269	1.886104
Wealth index	0.069133	0.166364	0.42	0.678	-0.25693	0.395201
Constant	-1.044263	5.252801	-0.2	0.842	-11.3396	9.251038
	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]

Children born and living						
Never married	-0.154495	0.091347	-1.69	0.091	-0.33353	0.024541
Married	0.517783	0.071188	7.27	0.000	0.378258	0.657308
Living together	0.268112	0.101679	2.64	0.008	0.068825	0.4674
Widowed	0.248879	0.100617	2.47	0.013	0.051673	0.446085
Divorced	-0.256397	0.141865	-1.81	0.071	-0.53445	0.021654
Protestant	0.020645	0.044019	0.47	0.639	-0.06563	0.106922
Muslim	0.035529	0.078214	0.45	0.65	-0.11777	0.188824
No religion	-0.321591	0.117792	-2.73	0.006	-0.55246	-0.09072
Urban	-0.037241	0.056716	-0.66	0.511	-0.1484	0.07392
Primary education	-0.192214	0.0612	-3.14	0.002	-0.31216	-0.07226
Secondary	-0.391648	0.072787	-5.38	0.000	-0.53431	-0.24899
Higher education	-0.404827	0.096792	-4.18	0.000	-0.59454	-0.21512
Central	-0.071031	0.0859	-0.83	0.408	-0.23939	0.097329
Coast	0.058844	0.083278	0.71	0.480	-0.10438	0.222066
Eastern	0.102247	0.085517	1.2	0.232	-0.06536	0.269857
Nyanza	0.06723	0.081074	0.83	0.407	-0.09167	0.226132
Rift Valley	0.469037	0.081632	5.75	0.000	0.309041	0.629033
Western	0.182713	0.08343	2.19	0.029	0.019194	0.346233
North Eastern	0.461632	0.117821	3.92	0.000	0.230708	0.692557
20-24	0.829746	0.088026	9.43	0.000	0.657218	1.002273
25-29	1.932482	0.088827	21.76	0.000	1.758384	2.10658
30-34	3.083727	0.090862	33.94	0.000	2.905641	3.261813
35-39	4.140883	0.093761	44.16	0.000	3.957115	4.32465
40-44	4.641504	0.097639	47.54	0.000	4.450136	4.832873
45-49	5.431587	0.100024	54.3	0.000	5.235544	5.62763
Age at first birth	-0.186492	0.005254	-35.5	0.000	-0.19679	-0.17619
Children under 5 years	0.6624	0.018255	36.29	0.000	0.626621	0.698179
Wealth index	-0.116902	0.017436	-6.7	0.000	-0.15107	-0.08273
sibling sex composition	-0.019055	0.033674	-0.57	0.571	-0.08506	0.046945
Constant	3.290735	0.170821	19.26	0.000	2.955933	3.625538

Table A6: Probit regression results of the LFP equation including first child sex and sibling sex composition as independent variables

Log likelihood = - 3235.0727

Number of obs = 5699

Labor force participation	Coef.	Std. Err.	z	p >z	[95 % Conf.	Interval]
Children born and living	-0.0237558	0.014384	-1.65	0.099	-0.05195	0.004436
Never married	-0.2632766	0.100651	-2.62	0.009	-0.46055	-0.066
Married	-0.3734584	0.080734	-4.63	0.000	-0.53169	-0.21522
Living together	-0.567768	0.111916	-5.07	0.000	-0.78712	-0.34842
Widowed	-0.1311413	0.114882	-1.14	0.254	-0.35631	0.094024
Divorced	0.0736702	0.162296	0.45	0.65	-0.24443	0.391765
Protestant	0.0835341	0.046953	1.78	0.075	-0.00849	0.175561
Muslim	-0.3032609	0.080727	-3.76	0.000	-0.46148	-0.14504
No religion	0.2719913	0.121637	2.24	0.025	0.033588	0.510395
Urban	-0.0885259	0.06108	-1.45	0.147	-0.20824	0.031188
Primary education	0.2906843	0.063745	4.56	0.000	0.165747	0.415621
Secondary education	0.3588689	0.076686	4.68	0.000	0.208568	0.50917
Higher education	0.7479796	0.107885	6.93	0.000	0.536528	0.959431
Central	0.3649718	0.093781	3.89	0.000	0.181164	0.548779
Coast	0.0539812	0.08784	0.61	0.539	-0.11818	0.226144
Eastern	0.0128202	0.091054	0.14	0.888	-0.16564	0.191283
Nyanza	0.4784569	0.088275	5.42	0.000	0.305441	0.651473
Rift Valley	0.1690128	0.087543	1.93	0.054	-0.00257	0.340595
Western	0.0213976	0.08858	0.24	0.809	-0.15222	0.195011
North Eastern	-0.5399878	0.128316	-4.21	0.000	-0.79148	-0.28849
20-24	0.5850287	0.093665	6.25	0.000	0.401449	0.768609
25-29	0.9413687	0.098371	9.57	0.000	0.748566	1.134172
30-34	1.239823	0.106954	11.59	0.000	1.030197	1.449449
35-39	1.251069	0.117203	10.67	0.000	1.021355	1.480783
40-44	1.399896	0.125863	11.12	0.000	1.15321	1.646583
45-49	1.343532	0.133841	10.04	0.000	1.081208	1.605856
Age at first birth	-0.0225641	0.006305	-3.58	0.000	-0.03492	-0.01021
Children under 5 years	-0.0504415	0.021511	-2.34	0.019	-0.0926	-0.00828
Wealth index	0.0439464	0.018678	2.35	0.019	0.007339	0.080554
Sibling sex composition	-0.0052249	0.036187	-0.14	0.885	-0.07615	0.0657

test sibling sex composition first child sex

1. (labor force participation) sibling sex composition = 0
2. (labor force participation) first child sex = 0

   chi2(2) =   0.85

  Prob > chi2 =   0.6522

Table A7: Probit regression results of the LFP equation including sibling sex composition as independent variables

Number of obs = 5699

LR chi2 (30)   = 1043.37

Prob > chi2   = 0.0000

Log likelihood = -3235.4919

Pseudo R2   = 0.1389

Labor force participation	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Children born and living	-0.0234534	0.0143812	-1.63	0.103	-0.0516401	0.0047332
Never married	-0.2649676	0.1006351	-2.63	0.008	-0.4622088	-0.0677265
Married	-0.3743746	0.0807307	-4.64	0.00	-0.5326039	-0.2161452
Living together	-0.5679649	0.1119386	-5.07	0.00	-0.7873604	-0.3485694
Widowed	-0.1301597	0.1148858	-1.13	0.257	-0.3553318	0.0950123
Divorced	0.0744664	0.1623835	0.46	0.647	-0.2437994	0.3927321
Protestant	0.0838002	0.0469505	1.78	0.074	-0.008221	0.1758215
Muslim	-0.3025013	0.080716	-3.75	0.000	-0.4607019	-0.1443008
No religion	0.2717423	0.1216438	2.23	0.025	0.0333249	0.5101597
Urban	-0.0891281	0.0610737	-1.46	0.144	-0.2088303	0.0305741
Primary education	0.2907387	0.0637436	4.56	0.000	0.1658036	0.4156738
Secondary education	0.3589555	0.0766848	4.68	0.000	0.2086561	0.5092549
Higher education	0.7468781	0.1078635	6.92	0.000	0.5354694	0.9582867
Central	0.3641122	0.0937762	3.88	0.000	0.1803144	0.5479101
Coast	0.0528989	0.0878285	0.60	0.547	-0.1192417	0.2250395
Eastern	0.0127156	0.091054	0.14	0.889	-0.165747	0.1911782
Nyanza	0.4780452	0.0882747	5.42	0.000	0.30503	0.6510604
Rift Valley	0.1682021	0.087537	1.92	0.055	-0.0033673	0.3397715
Western	0.0201199	0.0885629	0.23	0.820	-0.1534602	0.1937
North Eastern	-0.5385521	0.1283051	-4.20	0.000	-0.7900254	-0.2870788
20-24	0.5860642	0.0936639	6.26	0.00	0.4024864	0.7696421
25-29	0.9420405	0.098369	9.58	0.000	0.7492408	1.13484
30-34	1.24017	0.1069541	11.6	0.000	1.030544	1.449796
35-39	1.249185	0.1171851	10.66	0.000	1.019506	1.478863
40-44	1.399515	0.1258631	11.12	0.000	1.152828	1.646202
45-49	1.342416	0.133829	10.03	0.000	1.080116	1.604716
Age at first birth	-0.0225768	0.0063041	-3.58	0.000	-0.0349326	-0.0102209
Children under 5 yrs	-0.0510418	0.0215003	-2.37	0.018	-0.0931816	-0.0089019
Wealth index	0.0438234	0.0186763	2.35	0.019	0.0072186	0.0804282
Sibling sex composition	-0.0046546	0.0361793	-0.13	0.898	-0.0755647	0.0662555
Constant	-0.289509	0.1902274	-1.52	0.128	-0.6623477	0.0833298