Has fertility been declining in Mozambique? An analysis based on the proximate determinants framework

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Abstract

This paper uses the 1997, 2003 and 2011 Demographic and Health Surveys to examine the recent trends in fertility and its proximate determinants in Mozambique. Stover's (1998) modified version of Bongaarts proximate determinants model and decomposition methods were used to determine the contribution of each of the proximate determinants to the change in fertility over the period of 1997 to 2011. The data show that there is no clear evidence of fertility decline in Mozambique, except in urban areas and in southern region. Postpartum infecunability is by far the most fertility-inhibiting effect and has not changed in recent years. All proximate determinants except sexual activity contributed to an increase in fertility, offsetting the effect of a drop in the proportion of sexually active women. Many contextual factors have contributed to fertility behavior in Mozambique: long periods of political instability with impact on education and health sectors, economic and social policies adopted after the independence of the country in 1975.

1. Introduction

In contrast to most of sub-Saharan African countries, fertility decline in Mozambique has not been established. Available literature put Mozambique among sub-Saharan African countries where fertility transition is either at its early stages or has not initiated (Arnaldo, 2013; Francisco, 2011; Shapiro & Gebreselassie, 2009). During the last 50 years total fertility rate (TFR) declined by only about one child per woman, going from a TFR of 7.1 in 1950 to 5.9 in 2011 (Arnaldo, 2004, 2013; INE & MISAU, 2013). Arnaldo's (2004) analysis of the available data until 1997 found that fertility decline was only established in the southern region, while in Central and Northern regions there was no clear indication of a consistent trend towards lower fertility; the comparison of the DHS data shows a slow increase in the TFR from 5.6 in 2003 to 5.9 in 2011(INE & MISAU, 2005, 2013). As a result of high TFR, the corresponding young age structure pauses some challenges to the country in meeting the demands in the areas such as education, health and job creation. The prospects for Mozambique to reap the potential benefits of a demographic dividend may rest on how the country is able to engage in appropriate socio-economic policies to initiate or accelerate fertility decline.

In light of the uncertainty regarding the initiation and the stage of fertility transition, this paper examines the recent trends in fertility and its proximate determinants in Mozambique. Proximate determinants of fertility analysis was undertaken using the 1997, 2003 and 2011 Demographic and Health Surveys and decomposition methods were used to determine the contribution of each of the proximate determinants to the change in fertility over the period of 1997 to 2011.

2. The study context

Mozambique has a projected population of 25.7 million people in 2015 of which only 32% live in urban areas (INE, 2010). The population growth rate is estimated at 2.5% and during the last 50 years it has been increasing due to a declining mortality. The exception was the period between 1980 and 1997 where, because of the civil war-related excess mortality and emigration the population growth rate fell to 1.7% (Arnaldo, 2014; Arnaldo & Muanamoha, 2013). Despite experiencing an economic growth above 7% a year in most of the last two decades (INE, 2012) Mozambique remains a low income country with an estimated GDP per capita of USD 602 in 2014 (World Bank, 2014) and a Human Development Index (HDI) score of 0.393 in 2013 (UNDP, 2014). In 2008/9 the percentage of the population living below the poverty line of US$1 a day was estimated at about 55% (MPD, 2010).

The three major regions (North, Center and South) are different in terms of their socioeconomic development. The Northern Region is the poorest and the Southern Region is the most developed. In 2011, for example, the real GDP per capita in Southern Region was twice as high as in Northern and Central Regions. Less than half of the population in Northern and Central Regions had access to safe sanitation compared to more than two third in Southern Region (UNDP Mozambique, 2008). In 2007, only 50 per cent of the country's population was literate (37% in Northern, 46% in Central and 72% in Southern) and there was a large difference between the sexes: only 35 per cent of females were literate compared with 65 per cent of males (INE, 2013).

3. Data and Methods

Data

This paper is based on data obtained from the 1997, 2003 and 2011 Mozambique Demographic and Health surveys (DHS). The surveys were conducted by the National Institute of Statistic (INE) in collaboration with the Ministry of Health and all were nationally representative and were implemented to allow analysis for the country as a whole and separately by urban-rural areas of residence and by province. The 1997 DHS interviewed 8,779 women 15 to 49 and 2,335 men aged 15 to 64, corresponding to response rates of 92% e 81%, respectively (INE & MISAU, 1998); the 2003 interviewed 12,418 women 15 to 49 and 2,900 men aged 15 to 64, corresponding to response rates of 91% e 81%, respectively (INE & MISAU, 2005); and the 2011 interviewed 13,718 women 15 to 49 and 4,130 corresponding to response rates of 99% e 98%, respectively (INE & MISAU, 2013).

The background characteristics of the women included in this in this paper are presented in Table 1. About 40% of women interviewed in each of the surveys were bellow 25 years of age, one third between 25 and 34 years and one third between 35 and 49 years of age. Only a small proportion of women have gone beyond primary education having increased from 4.4% in 1997 to 18.5% in 2011; the percentage of women with no education decreased slightly from 42.9% in 1997 to 31% in 2011 while about half have only completed primary education. The Catholic Church (about 30%) is the most predominant religion followed by the Protestants (24%), Muslims (18%) and Zionists (18%). Consistent with the population distribution in the country, the central region is more represented in the sample than either northern or southern regions.

[Table 1 about here]

Methods

Published socio-economic and proximate determinants indicators were taken from the STATcompiler [1] website and additional fertility estimates were calculated from DHS microdata using Schoumaker's Stata module for computing fertility rates and TFRs from birth histories (tfr2) (Schoumaker, 2013).

Stover's (1998) modified version of the Bongaarts' (Bongaarts, 1978, 1982) proximate determinants of fertility framework was applied. The modified model produces more robust estimates than the original model, especially when: i) a considerable amount of sexual activity (and consequent childbearing) takes place outside of marriage; ii) the prevalence of sexually transmitted diseases (and consequent infertility) is high; and iii) a considerable proportion of women are sterilized (Stover, 1998:266). Stover (1998) rearranged Bongaarts' proximate determinants equation as follows:

$$TFR = Cx * Cu * Ci * Ca * Cf * PF ,$$

[1] http://www.statcompiler.com/

where TFR is the total fertility rate, Cx is the index of sexual activity, Cu is the index of contraception, Ca is the index of induced abortion, Ci is the index of postpartum infecundability, Cf is the index of infertility, and PF is the potential fertility. Stover's (1998) modifications imply a higher total fecundity (21) than in the original model (15.3). Because in the Stover's version all the effects of infecundity have been accounted for in the infertility index (C_f), the term 'total fecundity' is no longer appropriate to describe the residual fertility factor, Stover (1998) terms it 'potential fertility' or PF and defines it as the total fertility rate for a population of women who are sexually active and fecund for the entire period from age 15 to 49 and who do not practice breastfeeding, experience postpartum abstinence, nor practice contraception (Stover, 1998).

The contribution of each of the principal proximate determinants to fertility change between 1997 and 2003, 2003 and 2011 and 1997 and 2011 was estimated using a five-factor decomposition method (Das Gupta, 1978, 1993). The five factors include the four indices (sexual activity, contraception, postpartum infecundability and sterility) and a time invariant potential fertility of 21. The index of abortion was not included because it is almost equal to one and, therefore, its effect on fertility is negligible (See methodological note for details).

4. Fertility trends

Trends in total fertility rate

Despite some socioeconomic transformations, over the past half a century, total fertility rate has only fallen from about 7.1 children per woman in 1950 to 5.9 children in 2011 (Arnaldo & Muanamoha, 2011; INE & MISAU, 2013). The fertility level in 2011 was about 80% of its maximum level. Table 2 shows that with the exception of the Southern region and the urban population, there is no fertility decline in Mozambique for the last 15 to 20 years: for the country as a whole and for the northern and central regions the TFR has even increased during this period; for the urban population the decline is less than 2% while for the southern region the decline from 1997 to 2011 was by 13.5%. From 2003 to 2011 the TFR increased in all regions and areas.

There are big variations in TFR according to place of residence, region, education and whealth index. For instance, in 2011, total fertility rate in rural areas was 6.6 births per woman compared to 4.5 in urban areas; the fertility of women with secondary education or higher was almost half of that of women with primary or no education; the fertility of women in the southern region was about 30% lower than that of women in the nothern and central regions. The rural-urban, uneducated-educated and south-rest of the country fertility gaps have been widening: rural-urban TFR gap increased from 14% in 1997 to 32% in 2011, the uneducated-secondary or higher education TFR gap increased from 36% in 1997 to 43% in 2011 and the women in the southern region- women in the northern and central regions TFR gap from 9% in 1997 to 35% in 2011.

[Table 2 about here]

[Figure 1, about here]

Figures 1 presents the annual total fertility rates estimates from 1982 to 2011 estimated from Censuses and DHS data. The TFR from census were taken from Arnaldo (2007) and were estimated by the own-children method (Retherford *et al.*, 1979) and the TFR for the last 15 calendar years before each of the three DHSs were estimated using Schoumaker's (2013) tfr2 methods. In general total fertility rates have been consistently declining in the Capital city, Maputo, in the urban areas of the southern region and to a less extant in the southern region as a whole.

Arnaldo '(2014) analysis of census data reported a war-driven fertility decline in the late 1980's and suggested that the increase in total fertility rate after 1994 was a response to the political stability achieved after the general peace agreement signed between Renamo and the government in 1992 and after the country has successfully held its first general elections in 1994. Crisis-led fertility declines are usually followed by rebounds as the severity of the conditions leading to the decline lessens and the couples and families may tend to compensate for the lost reproductive time (Lindstrom & Berhanu, 1999).

Trends in adolescent fertility

Part of the explanation for high fertility in Mozambique lays on the early beginning of childbearing. Despite substantial increases in access to education among youth and adolescents[2], particularly in urban areas, during the last 15 years, childbearing still begin at a young age in Mozambique. In 2011, about 40% of adolescents aged 15 to 19 years were already mothers or were pregnant and this percentage had barely changed in the last 15 years. The beginning of childbearing is earlier in rural areas and in Central and northern regions as compared to urban and southern region, respectively. For instance, in 2011 the percentage of adolescent 15-19 who had been mothers or were pregnant was above 50% in rural area and in central and northern regions compared to less than 50% in urban and southern region.

Analysis of the DHS data by Arnaldo, Frederico and Dade (2014) show that about 10% of women aged 18-24 years had became mothers by age 15 and more than half by age 18 and the percentage was much higher in central and northern regions than in the southern (Figure 3). The adolescent fertility rate, as measured by the age specific fertility rate in age group 15-19, was about 170 children per thousand adolescents and has remained almost unchanged between 1997 and 2011. Most important factors contributing to the current level of adolescent fertility in Mozambique were related to high exposure to the risk of

[2] The percentage of adolescents aged 15-19 with no education reduced from 28% in 1997 to 13% in 2011, and the percentage of those with secondary education or high increased from 5% in 1997 to about 30% in 2011.

childbearing due to an early sexual initiation and marriage. Since contraceptive use is low[3] sexually active teenagers are at risk of an unwanted pregnancy: in 2011, at least 30% of the adolescents who were pregnant in the last five years before the survey did not want the pregnancy then (Arnaldo *et al.*, 2014).

[Figure 3 about here]

Social changes resulting in some relaxation of the inhibition and stigma related to sexuality in sub-Saharan Africa and a weakening of parental control over adolescents and exposure to the outside world might stimulated sexual activity among adolescents and increase the risk of an early pregnancy that may lead to an early marriage or childbearing (Gama, Szwarcwald & Leal, 2002; Magadi & Agwanda, 2009). A qualitative study in the cities of Maputo, Quelimane and Lichinga report that adolescents are exposed to television programs and novels and other information through friends, classmates and social media that are beyond the control of their parents and can stimulate them to anticipate the initiation of sexual activity and put them at risk of an early pregnancy and childbearing (Arnaldo, Frederico & Maungue, 2015).

Trends in desired fertility

The fertility preference or desired fertility is an important factor for understanding fertility trends because it can be viewed as an expression of the demand for children (Bacci, 2001). In Mozambique the men ideal number of children is about one child higher than the actual total fertility rate and has been declining in contrast to the actual TFR, which has increased from 1997 to 2011 (Figure 4). Excess fertility, higher actual fertility than the desired family size is common in pre-transitional societies or during most of the fertility transition period and may reflect the insufficient command over reproduction by women and men, together with the drive to replace unexpected deaths and dissatisfaction over the sex balance achieved among one's children and limited access to family planning services (Bongaarts, 2001; Muhoza, Broekhuis & Hooimeijer, 2014). The difference between actual and desired fertility is higher among poor and a uneducated women than among the rich and more educated women meaning that the poor and uneducated may have less access to family planning services than their counterparts who are educated and have better socioeconomic conditions (Table 3). In fact, unmet need for contraception is higher among poor, rural and uneducated than rich, urban or better educated women (INE & MISAU, 2013).

Figure 4 also shows that the mean ideal number of children for men is about one child higher that for the women and, at least in 2011, the TFR is very close to the men's desired family size than is to the desired family size by the women. Because of the unbalanced gender relations, where Mozambican women usually have low socioeconomic status and are not economically independent, women's preference in family size is likely to be influenced by husbands or partners and other family members desires and, in some cases the partner's preference has more influence than the women's one (Ibisomi, 2008; Yeatman & Sennott, 2014).

[3] In 2011, only 15.3% (28% urban and 7.1% rural) of sexually active adolescents were using contraception.

5. The proximate determinants of fertility

Fertility trends and variation are better understood by looking at the proximate determinants, the biological and behavioural factors influence fertility directly. According to Bongaarts (1978), the proximate determinants are the main mechanisms through which fertility levels differ between populations and the change in fertility can only occurs when at least one of proximate determinants changes. As stated earlier, proxiamte determinats analysis was perfomed through the aplication of the Stover (1998) version of the Bongaarts (1978) model. Figures 5 and 6 present measures of the proximate determinants by women's socioeconomic characteristics.

[Figure 5 about here]
[Figure 6 about here]

Marriage and sexual activity

Sexual activity and marriage patterns determine the period of exposure to the risk of pregnancy. By the age of 16 at least half of Mozambican women are sexually active and by 19 have been married. Although there has been a trend towards a late age at first marriage or union, this increase has been very slow (Table 4). For instance, in 1980, slightly more than half (53.2%) of women aged 15-19 were married. This percentage fell to 45.2% in 1997, and to 45% in 2007 (Arnaldo *et al.*, 2011). The mean age at first marriage was 17.5 years in 1980, 18.1 years in 1997 and 18.6 years in 2007, an increase of just one year, or by 6%. As a result of this sexual and marriage patterns, the index of sexualy activity indicates that about 75% of fecund women of reproductive age are sexually active (Cx=.783 (1997), .770 (2003) and .739 (2011). Non-sexual activity reduced fertility by about 26% in 2011.

The effect of sexual activity by women's socioeconomic charateristics show the expected variation: the fertility-inhibiting effect of non-sexual activity is higher (Cx index is lower) among urban, educated and rich women than rural, uneducated and poor women as the former have lower percentages of women who are sexually active.

[Table 4 about here]

Breastfeeding and non-susceptible period

Almost all (98%) all children born during the three years preceding the DHSs were breastfed. On average Mozambican women breastfed their children for about two years and the combination of long breastfeeding practices and postpartum sexual abstinence give an insusceptibility period of approximately 18 months. This period is slightly shorter in urban area compared to rural and has not changed significantly in last 15 years. In some ethnic groups women are expected to abstain from sexual intercourse for the entire duration of breastfeeding whereas in others women can resume sexual relations before weaning but they rarely resume before at least one year after the birth of the child (Arnaldo, 2007).

Postpartum infecundability index was the lowest, estimated at .531 (1997), .529 (2003) and .554 (2011) and accounts for the most fertility reducing effect, 52% in 2011. The promotion

of exclusive breastfeeding during the first six months and child spacing of at least two years and the belief that a man's sperm can endanger the health of a suckling child by poisoning the breast milk have helped to keep a long period of non-susceptible period (Arnaldo, 2007). The median duration of exclusive breastfeeding increased from .09 months in 1997 to 1.4 months in 2011; the percentage of children under 6 months of age being exclusively breastfed increased from 30% in 2003 to 43% in 2011 (INE, 2009; INE & MISAU, 2013).

Postpartum infecundability has a stronger fertility reducing effects among rural than urban women, less or non educated than educated women, poor than rich and among women in the central and northern regions than women in the southern region.

Contraceptive use

Although women are increasingly aware of family planning methods, the actual use of these methods remains low in Mozambique. Table 4 shows that percentage of married women currently using modern contraception increased from 1997 to 2003 but decreased from 2003 to 2011 in both rural and urban areas. At the same time the unmet need for contraception has increased from 24% in 1997 to 28% in 2011. This increase in the unmet need for contraception may suggest that women or couples are increasingly seeking family planning services, but the health system have not been able to fully account for the demand for these methods.

The analisis of the proximate determinants shows that contraception is the third most important fertility-inhibiting factor after postpartum infecundability and sexual activity. Following the trends in contraceptive prevalence, contraception index (Cu) decreased from .888 in 1997 to .738 in 2003 and increased to .805 in 2011. The index of contraception reduces fertility from its potential by about 13% and the reducing effect is higer among urban, educated and women living in the southern region as compared to rural, uneducated and those living in central and northern regions (Figures 5 and 6).

Sterility

The prevalence of infertility-related diseases such as malaria, tuberculosis and venereal diseases, and poor access to adequate treatment have been considered the factors behind high prevalence of infertility in Mozambique in the 1970s, 1980s and 1990s (Arnaldo, 2007; United Nations, 1981). Table 4 show that the level of infertility, as measured by the percentage of women aged 45-49 who are childless is higher in rural than in urban and has been declining. Sterilty is the fourth most inportant fertility reducing factor and its index increased from .878 in 1997 to .968 in 2011, meaning that its effect on fetility is becoming less important. Sterility reduced fertility from its potencial by about 12% in 1997 and 3% in 2011 and has a greater effect in inhibiting fertility among rural than urban women, poor than rich and uneducated than educated women, probably due to lower access to treatment of infertility-related diseases and less coverage of health facilities in rural than in urban areas.

Abortion

Estimated abotion has a negligible effect on fertility in Mozambique. The index of abortion in very close to 1.0 and reduces fertility by less than 1%.

5. Decomposition of change in total fertility rate

The analysis of the indices of the proximate determinars in the previous section has shown how much effect each proximate determinat influenced the observed total fertility rate in each of the three data points and that influence changes over time. However, when data from at least two darta points are avaliable, an interesting analysis is to determine the contribution of each proximate determinat to the change in TFR observed between two data points. To that effect, a five-factor decomposition methods was used to detrermine the contribution os the proximate determinats to the fertility change for three periods (1997-2003, 2003-2011 and 1997-2011), and the results are presented by place of residence, level of education and region (Figure 7).

The results show very important contributions of sexual activity and contraceptive use to the recent trends of fertility in Mozambique. Non-sexual activity related to an increasing age at marriage has suppressed fertility in Mozambique during the last 15 years. The increase in contraceptive use contributed to the decline in TFR from 1997 to 2003 but its stagnation or decrease from 2003 to 2011 has contributed to the increase in TFR in this period; the decrease in prevalence of primary and secondary infertilty has contributed to an incresed in TFR particularly among rural and unedcuated women; the universal practice of long breastfeeding and portpartum abstinece has been supressing TFR among rural, uneducated and women living in the northern region. In sumary, the decompositon show that all proximante determinants except sexual activity contributed to an increase in TFR, offsetting the effect of a drop in the proportion of sexually active women.

6. Discussions and Conclusion

Data from three Mozambique's Demographic and Health Surveys were used to trace fertility trends in Mozambique and the relative importance of the proximate determinants on fertility level and change over time. The results show that fertility trends and the relative contribution of the proximate determinants of fertility on its level and change over time are heterogeneous across the three major regions and women's socioeconomic characteristics. With the exception of urban areas and the prosperous southern region total fertility rate has not been declining in recent years. It has even increased from 5.2 children per woman in 1997 to 5.9 in 2011. The devastating 16-year civil war may have depressed fertility during the late 1980s and early 1990s (Arnaldo, 2014), and the increase observed from the late 1990s may suggest a post-war baby boom. The uncertainty and confusion that results from a civil war, or the change in social order related to it, the delay in the formation of marital unions and the spousal separation because of conscription that characterizes the conflict may have discouraged births temporarily and, when the conflict came to an end, a rebound may have followed as the conditions leading to the decline in births lessened and women compensated for the lost time(Lindstrom & Berhanu, 1999; Randall, 2005).

The analysis of the proximate determinants of fertility show that Mozambique has not adopted modern reproductive behavior. Postpartum infecundability is the most important fertility reducer in Mozambique, accounting for about 52% of the total reduction and this effect has not changed significantly during the last 15 years. Sexual activity has been the second most important reducer (about 26%), followed by contraception (about 19%), infertility (about 3) and abortion with less than 1%. The effect of sexual activity increased from 1997 to 2011; that of contraception increased from 1997 to 2003 and decreased from 2003 to 2011. In contrast, the effect of sterility has been decreasing owing to the decline in the prevalence of infertility in the population.

The decomposition analysis shows that the decrease in the proportion of sexually active women, due to an increasing age at first marriage, and the increase in contraceptive use contributed to a decrease in total fertility rate between 1997 and 2011. But the decrease in sterility and postpartum infecundability had a positive effect on fertility. For the country has a whole, central and northern regions, rural, poor and uneducated women the depressing effect of non-sexual activity and slight increase in contraception was offset by the positive effect of decreasing sterility and postpartum infecundability, resulting in the increase in total fertility rate. In southern region, urban areas and among rich and educated women the magnitude of the depressing effect due to decreasing proportion of non-sexually active women and increase in contraceptive use is higher than the positive due to the decrease in infecundability period and sterility and fertility declined from 1997 to 2011.

High fertility has been sustained by high exposure to the risk of childbearing related to early sexual debut, early marriage and low use of contraceptive methods. Sexual activity and marriage patterns are important determinants of the period of exposure to the risk of pregnancy. The median age at sexual debut is low at about 16 years and has remained unchanged in the recent past; the age at first marriage which, marks the beginning of regular exposure to sexual relations from which a woman may become pregnant and give birth, has been slowly increasing but Mozambican women still marry at an young age: in 2007 the female mean age at first marriage was estimated at 18.6 years and about 45% of adolescents aged 15-19 had been married and 14% of the never married were already mothers. The fact that sexual activity starts early the incidence of adolescent pregnancy and childbearing is high and has some health implications for both the young woman and her new born baby, and social implication for the young woman since an early pregnancy or childbirth usually leads to a permanent or temporary school drop out which may hinder her future professional carrier.

The adoption of modern forms of contraception has been the main driver of fertility transition in many countries (Erfani & McQuillan, 2008; Letamo & Letamo, 2002; Madhavan, 2014). Access and availability of family planning services is one of the key factors with a direct impact on fertility trends. One of the recommendations of the 1994 Cairo population conference was that governments should guarantee and increase access to family planning services to allow women or couples to exercise their reproductive choices in terms of family size (United Nations, 2003). This is far from being achieved in Mozambique as the experience and current use of modern contraception among married women is low (about 10%) and did not increase between the last two Demographic and health surveys. The unmet need for contraception has been increasing and Mozambican women are having

more children that what they would like to have either because the health system is unable to meet the demand or they are not able to negotiate their family size preference with their partners or older family members.

Education is one of the main determinants of fertility behavior. Women's education, particularly secondary education is related to low fertility. In Mozambique, despite significant progress in the last three decades, women's illiteracy remains very high and the school attendance rate is lower among girls compared to boys. In 2007, at the last census, about two third (64%) of the Mozambican women aged 15 and above were illiterate and this percentages was above 80% in some provinces in central and northern regions of the country(INE, 2013). The difference between sexes although narrowing it is still high: the Gender Disparity in Literacy Index (GDLI)[4](Jejeebhoy, 1995), the number of literate women aged 15 and over per 1000 literate men aged 15 and over, increased from 587 in 1997 to 626 in 2007, meaning a reduction in gender disparity between the two censuses, but disparity is sill large.

[4] This index measures the degree to which the society is gender-stratified. Low values indicate a high level of disadvantage for women in comparison with men, that is, high gender-stratification, and high values indicate that women are less disadvantaged in relation to men. In a situation of equality, this index is equal to 1,000, and values of less than 1,000 show that women are disadvantaged compared with men, while values above 1,000 show that men are disadvantaged. The further it is from 1,000, the greater the inequality between the two sexes.

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Table 1: Socio-demographic characteristics of women interviewed in the three Demographic and Health surveys, Mozambique 1997-2011

Background characteristics	1997 DHS	2003 DHS	2011 DHS
Age group			
15-24	39.9	39.5	40.1
25-34	31.8	32.3	31.1
35-49	28.4	28.1	28.8
Education			
No education	42.9	41.1	31.2
Primary	52.7	51.1	50.2
Secondary or high	4.4	7.8	18.5
Place of residence			
Urban	23.9	36.6	34.7
Rural	76.1	63.4	65.3
Religion			
Catholic	30.3	30.3	29.1
Protestant	13.9	27.2	24.1
Muslim	17.7	18.8	17.6
Zionist	10.1	8.8	17.6
Other	6.8	0.5	2.2
No religion	21.2	14.5	9.5
Region			
North	28.1	31.8	26.3
Centre	37.8	37.1	47.3
South	34.1	31.1	26.4
No. of cases	8,779	12,418	13,718

Source: 1997, 2003 and 2011 DHS.

Table 2: Trends in Total fertility rate by women's socioeconomic characteristics, Mozambique 1997-2011

Socio-economic characteristics	Total fertility rate			% Change		
	1997	2003	2011	1997-2003	2003-2011	1997-2011
Place of residence						
Urban	4.6	4.4	4.5	-4.5	2.8	-1.8
Rural	5.3	6.1	6.6	15.2	7.8	24.3
Education						
No education	5.1	6.3	6.8	23.2	8.7	33.8
Primary	5.4	5.3	6.1	-1.9	14.0	11.9
Secondary +	3.5	2.9	3.4	-16.1	17.5	-1.4
Religion						
Catholic	5.1	5.2	6.0	2.8	14.6	17.9
Protestant	5.8	5.4	5.8	-6.9	8.1	0.6
Muslim	4.5	5.8	5.9	29.0	1.3	30.7
Zionist	5.5	5.3	5.8	-3.6	8.7	4.8
Other religion	5.9	5.7	4.1	-1.9	-27.9	-29.3
No religion	5.1	6.2	6.6	21.8	6.4	29.6
Wealth Index						
Poorest		6.3	7.2		13.9	
Poorer		6.1	7.2		18.8	
Middle		6.3	6.3		-0.2	
Richer		5.2	5.6		6.6	
Richest		3.8	3.7		-2.5	
Region						
Northern	5.0	6.2	6.4	23.0	3.3	27.1
Central	5.5	6.0	6.6	9.0	9.7	19.6
Southern	5.0	4.3	4.3	-13.6	0.2	-13.5
Mozambique	5.2	5.5	5.9	7.0	7.0	14.5

Source: 1997, 2003 and 2011 DHS.

Figure 2: Trends in Annual Total fertility rate, Mozambique 1982-2010

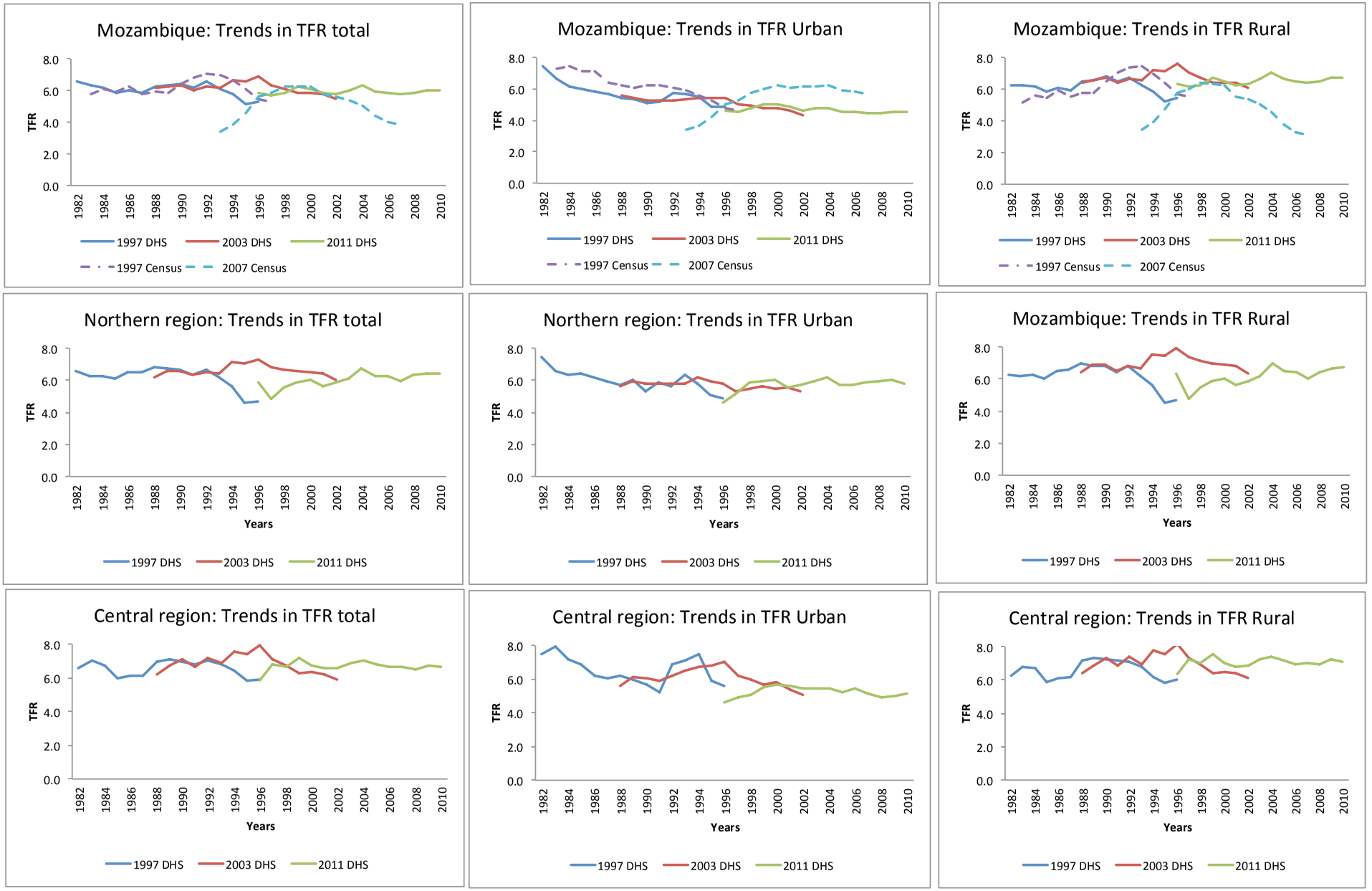
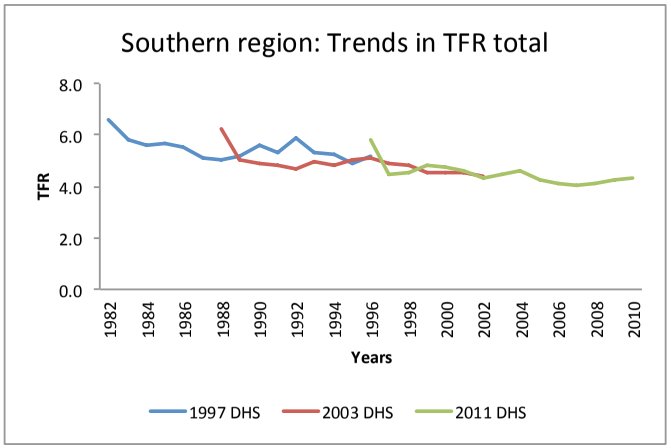
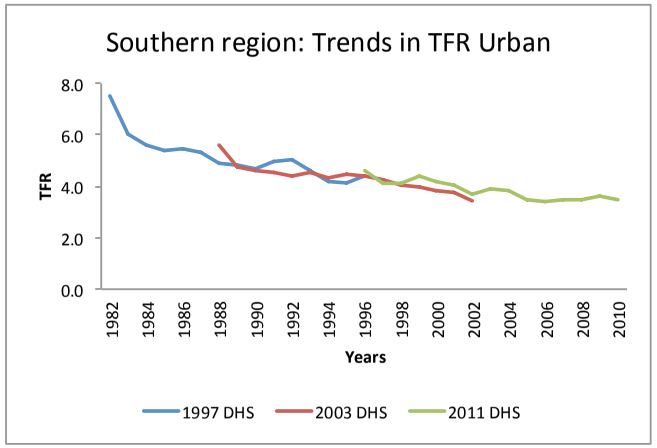
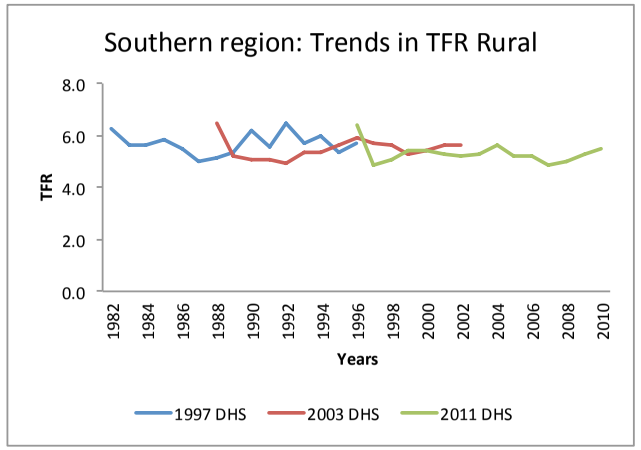
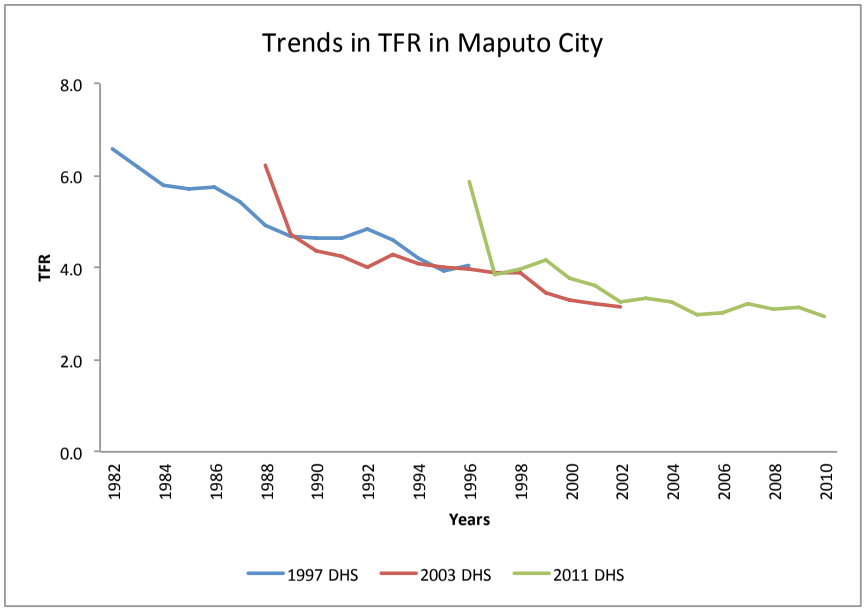


Figure 2: Continued…



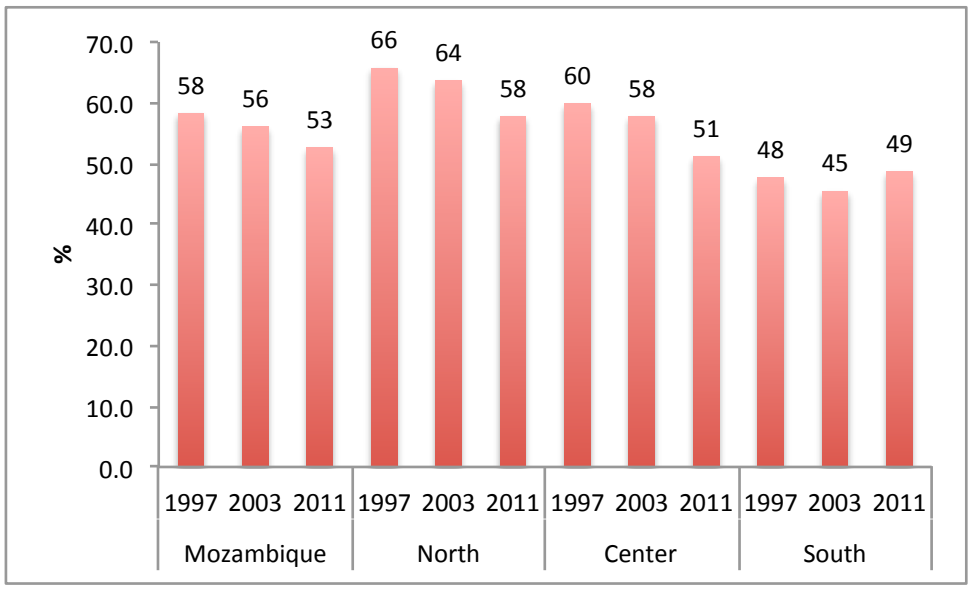






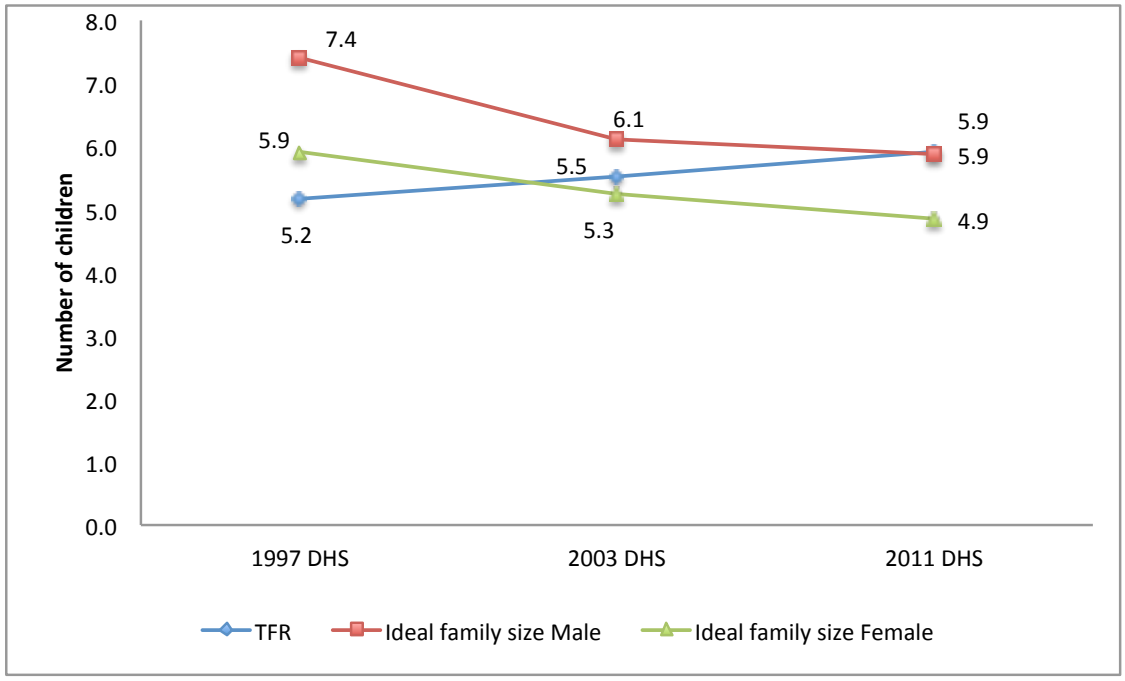
Source:Author's calculations based on the 1997, 2003 and 2011 DHSs.

Figure 3: Percentage of women 18-24 who were mothers before de age of 18 by region, Mozambique 1997-2011



Source: 1997, 2003 and 2011 DHS.

Figure 4: Total fertility rate and disired family size for women and men, Mozambique 1997-2011



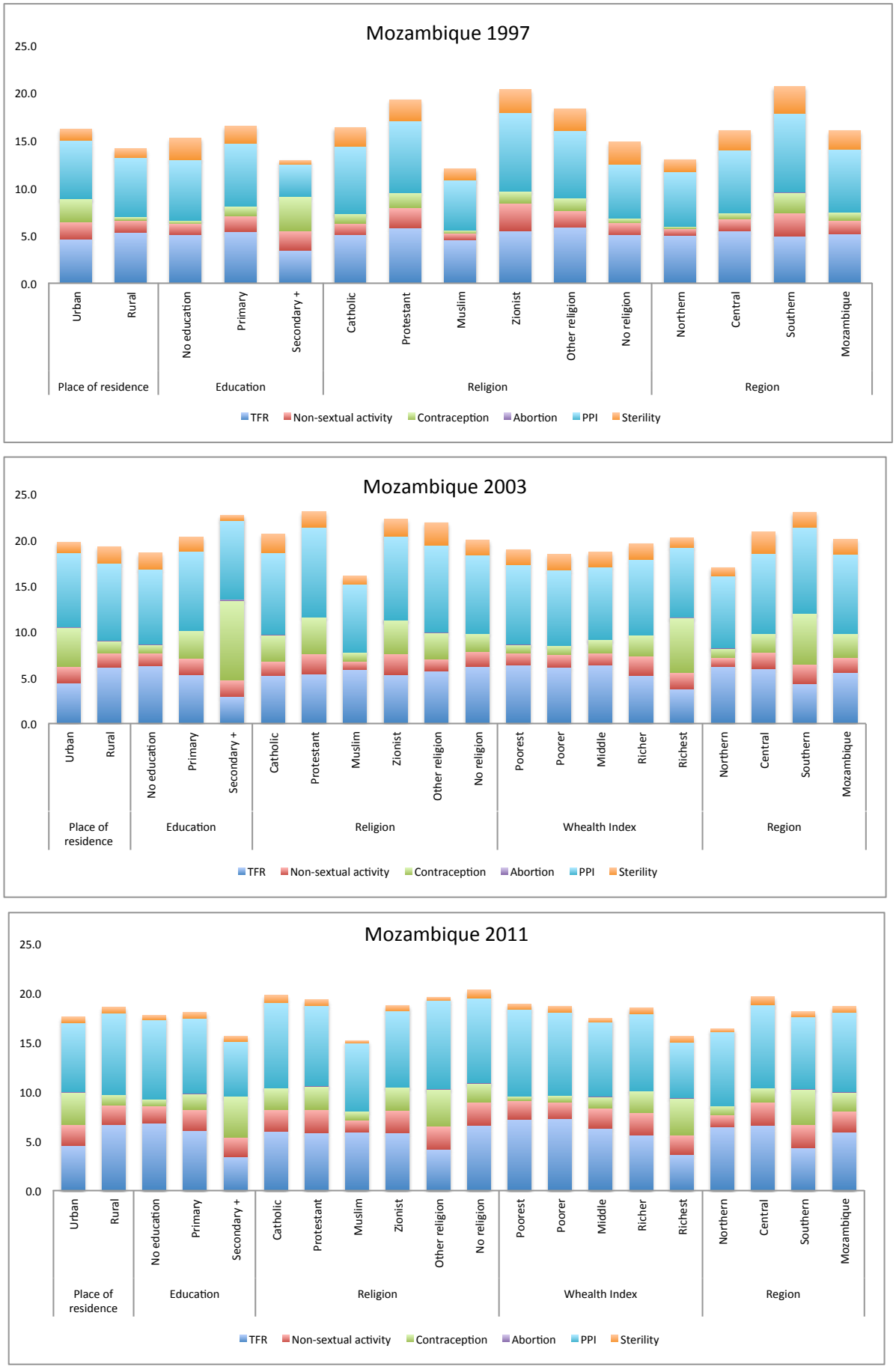
Source: 1997, 2003 and 2011 DHS.

Table 3: Disired family size for women and men by selected socioeconomic characteristicis, Mozambique 1997-2011

Socioeconomic characteristics	Male			Female			Total fertility rate-Women's preference difference		
	1997	2003	2011	1997	2003	2011	1997	2003	2011
Place of residence									
Urban	5.3	4.9	4.6	4.8	4.6	4.0	-0.2	-0.2	0.5
Rural	8.4	7.0	6.6	6.2	5.7	5.3	-0.9	0.5	1.4
Education									
No education	8.1	7.0	7.6	6.6	5.9	5.7	-1.5	0.4	1.1
Primary	7.8	6.4	6.2	5.5	5.0	4.9	-0.1	0.3	1.2
Secondary or higher	4.6	4.2	4.3	3.4	3.4	3.4	0.0	-0.4	0.1
Wealth Index									
Poorest		7.2	6.3		5.9	5.6		0.4	1.7
Poorer		7.1	6.8		5.8	5.6		0.3	1.6
Middle		6.9	6.8		5.7	5.3		0.6	1.1
Richer		5.6	5.9		5.1	4.6		0.1	1.0
Richest		4.4	4.2		4.0	3.6		-0.2	0.1
Region									
Northern	8.7	7.1	6.3	6.5	6.0	5.3	-1.4	0.3	1.1
Central	7.1	6.0	6.1	6.2	5.5	5.2	-0.7	0.5	1.3
Southern	6.9	4.9	4.8	5.0	4.3	3.7	0.0	0.0	0.6
Mozambique	7.4	6.1	5.9	5.9	5.3	4.9	-0.7	0.3	1.1

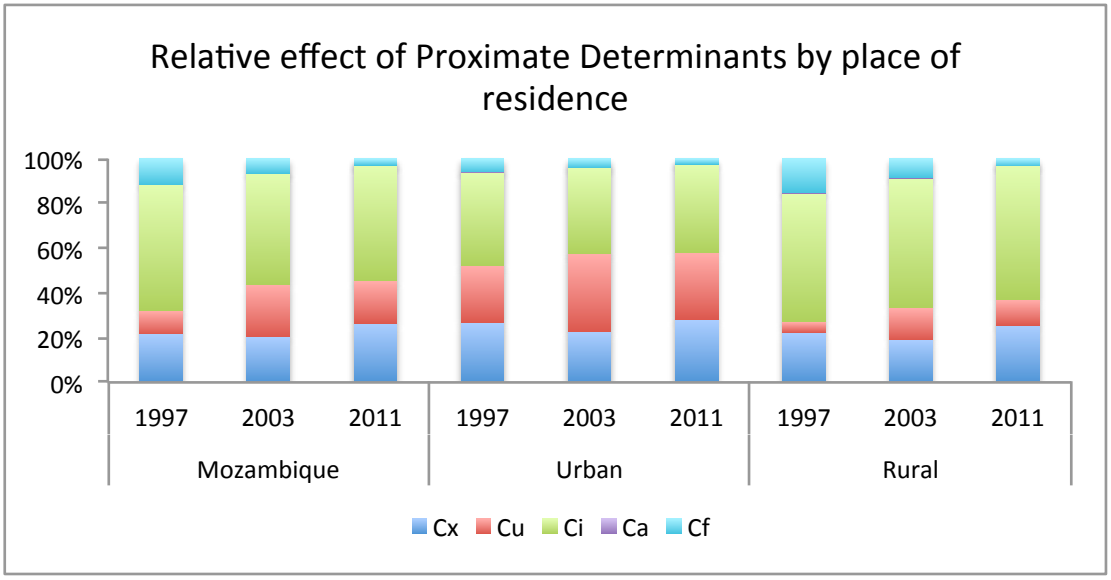
Source: 1997, 2003 and 2011 DHS.

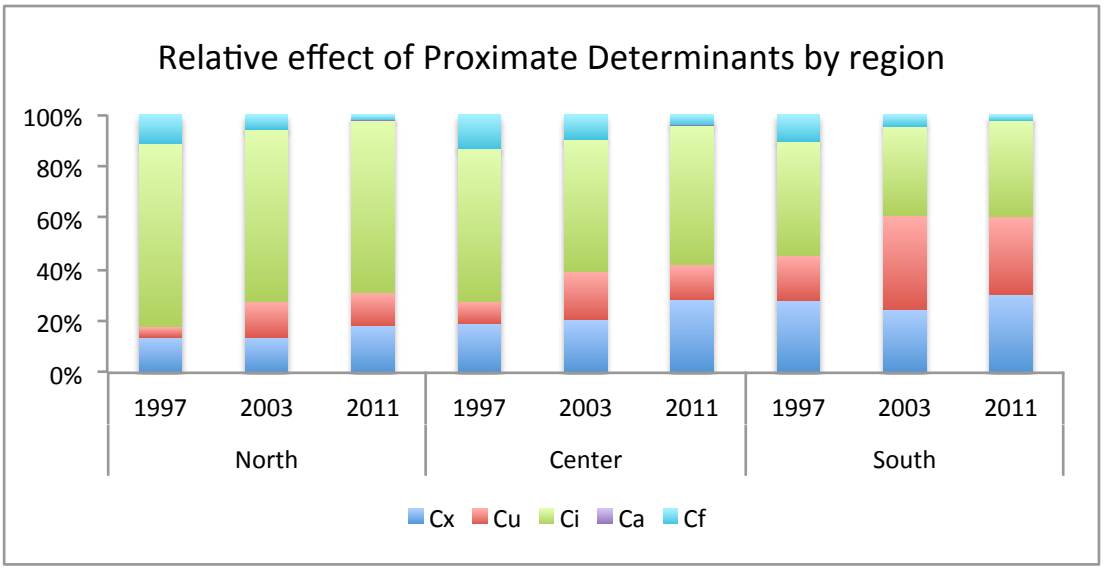
Figure 5: Proximate determinants effects on total fertility rate, Mozambique 1997-2011

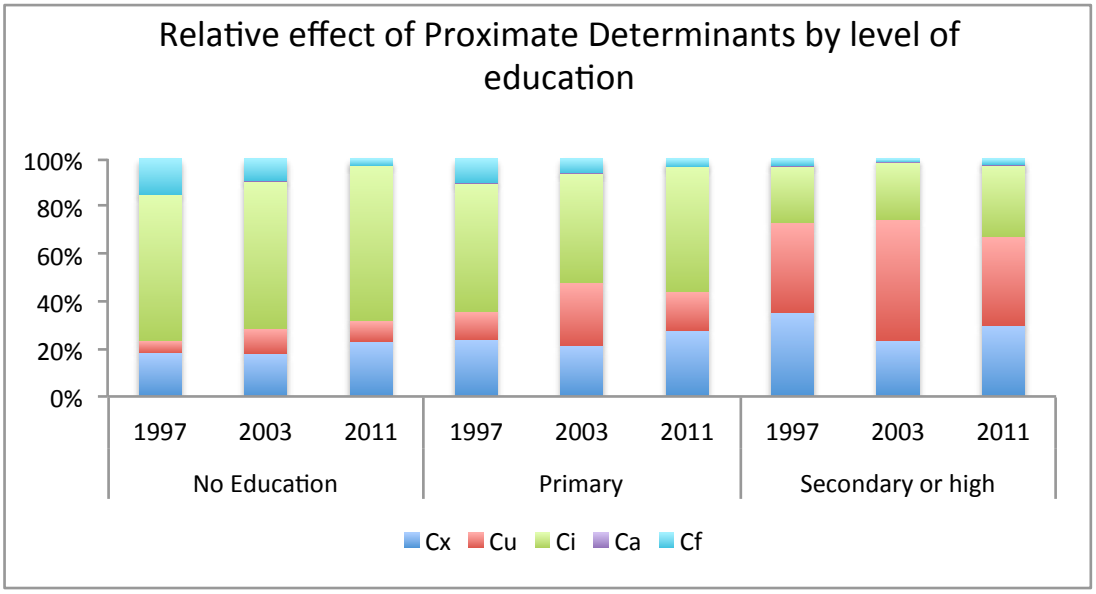


Source:Author's calculations based on the 1997, 2003 and 2011 DHSs.

Figure 6: Relative effect of the proximate determinants on total fertility rate, Mozambique 1997-2011







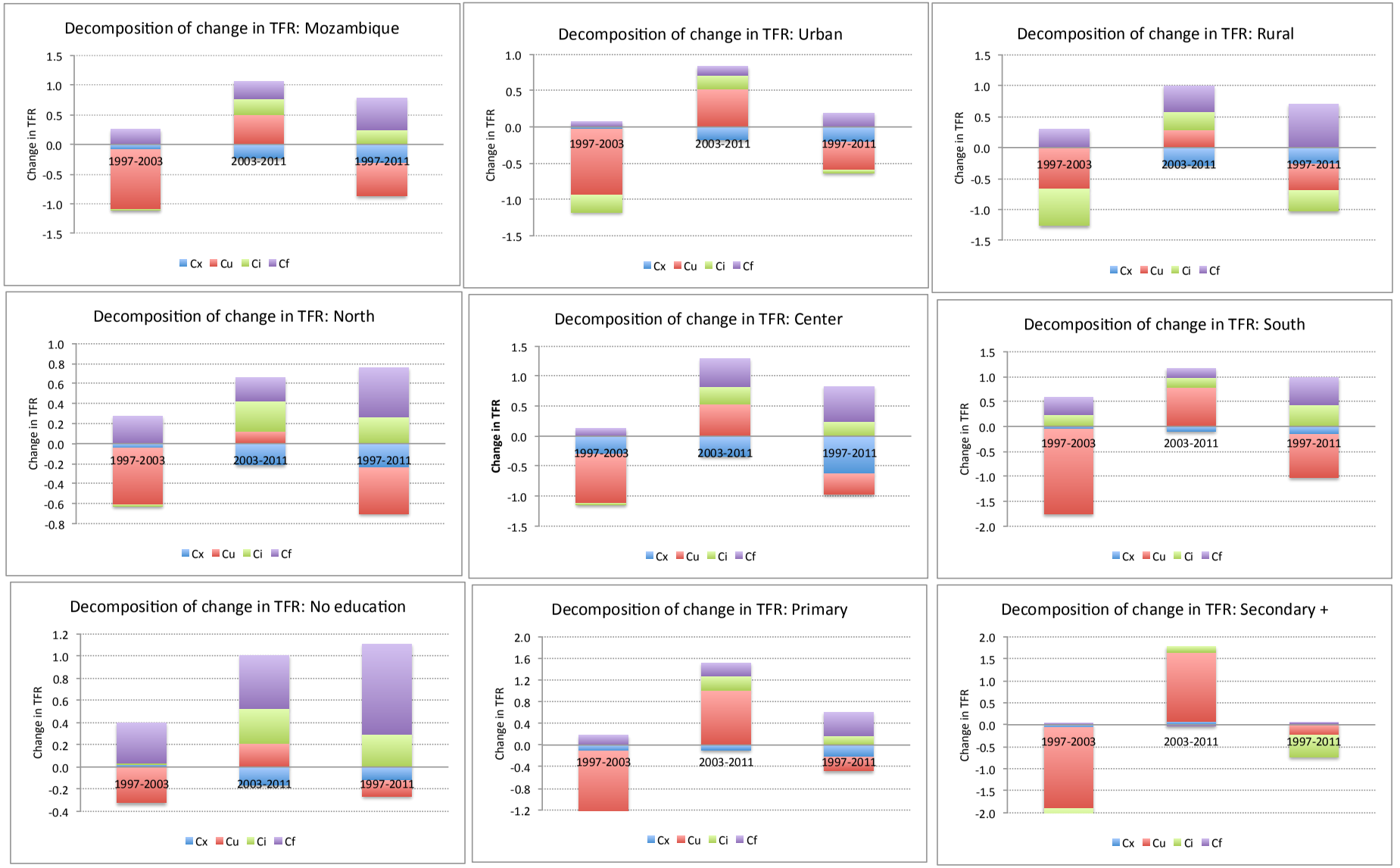
Source:Author's calculations based on the 1997, 2003 and 2011 DHSs

Table 4. Measures of the proximate determinants of fertility, Mozambique 1997-2011

	Total	Urban	Rural
Median age at first intercourse (25-49)			
1997	15.9	16.5	15.8
2003	16.1	16.6	15.9
2011	16.1	16.6	15.8
Median age at first marriage (25-49)			
1997	17.1	18.1	16.8
2003	17.5	18.1	17.1
2011	18.8	19.6	18.5
Current modern contraceptive use (married women)			
1997	5.1	16.6	2.3
2003	20.8	28.3	17.7
2011	11.3	21.1	7.2
Non-Susceptible period (months)			
1997	19.2	15.3	19.3
2003	19.3	17.1	20.2
2011	17.6	15.6	18.4
%45-49 Childless			
1997	5.7	3.6	6.2
2003	3.1	3.1	3.2
2011	4.0	3.6	4.1

Source: ICF International, 2012. The DHS Program STATcompiler - http://www.statcompiler.com - July 28 2015; 1997, 2003 and 2011 DHSs.

Figure 7: Decomposition of Change in total fertility rate, Mozambique 1997-2011



Source:Author's calculations based on the 1997, 2003 and 2011 DHSs.

Appendix

A1. Methodological note

Calculation of the Bonggarts indices:

a) Index of sexual activity (Cx): represents the reduction in fertility caused by periods during which a woman is not sexually active. Cx is taken as the proportion of women aged 15 to 49 who were sexually active in the last month added to women who are not now sexually active but are currently pregnant or practising postpartum sexual abstinence (Stover, 1998).

b) Index of contraception (Cu): Cu measures the fertility-inhibiting effect of contraceptive use and is calculated from the proportion of all women of reproductive age currently using specific methods of modern and traditional forms of contraception, weighted by each method's use effectiveness as shown in Table 1. Thus,

$Cc = 1 - u * e$,

where u is the proportion of sexually active, fecund women using contraceptives that does not overlap with that experiencing postpartum amenorrhoea; and e is the average effectiveness of contraception.

Table A1: Contraceptive use-effectiveness rate by method of contraception

Contraceptive method	Use-effectiveness rate (%)
Oral contraceptive pill	92
Injectable	100
Implants	100
Barrier methods	81
Sterilization (male or female)	100
Intrauterine device (IUD)	96
Withdrawal or rhythm	50
Other traditional	10

Source: Madhavan and Guengant (1996:Table 2).

c) Index of postpartum infecundability (Ci): measures the effect of the extended periods of postpartum amenohrroea and abstinence on fertility. It is calculated as the average birth interval in the absence of breastfeeding, divided by the average length of the interval when breastfeeding takes place:

$$Ci = \frac{20}{18.5 + i}$$

where i is the average number of months of postpartum infecundability due to the combined effect of postpartum amenorrhoea and abstinence. To account for the impact of abstinence prolonged beyond the period of amenorrhoea, which is common in Mozambique, Ci will be estimated combining the effects of both postpartum abstinence and lactational amenorrhoea, as follows:

$$Ci = Camen * Cabst ,$$

where

$$Camen = \frac{20}{18.5 + amen}$$

$$Cabst = \frac{(18.5 + amen)}{(18.5 + i)}$$

where Ci is the index of postpartum infecundability; $Camen$ is the index of impact of lactational amenorrhoea; $Cabst$ is the index of additional impact of abstinence prolonged beyond the period of amenorrhoea; $amen$ is the mean duration (in months) of postpartum amenorrhoea; and i is the mean duration of infecundability due to combined effects of postpartum amenorrhoea and postpartum sexual abstinence.

d) Index of infertility (Cf): is the Stover's (1998) version of the Bongaarts' Index of Sterility (Ip) and is intended to measure the fertility-inhibiting effects of primary and secondary infertility due to disease or any other cause. A woman is defined as infertile if she is not menopausal, postpartum amenorrhoeic, not pregnant, has not used a contraceptive method, has been in union during the last five years and has not given birth during that period. Thus the Cf index is calculated as follows:

$$Cf = 1 - f$$

where f is the proportion of sexually active women who are infertile. Because Cf takes into account all forms of infertility, not only primary infertility as the Ip index (index of infertility in the original model) it is more likely to give better results of the impact of infertility because secondary infertility is higher than primary infertility in Mozambique(Arnaldo, 2007).

Index of abortion (Ca): is intended to measure the fertility-inhibiting effects of due to induced abortion and is calculated as follows:

$$Ca = \frac{TFR}{TFR + 0.4(1+u)TAR}$$

Reliable data on the prevalence of induced abortion are unavailable in Mozambique. Thus, for this paper total abortion rate (TAR) estimates will be obtained using the regression estimation approach by Westoff (2008) using the following equation:

$$TAR = 3.63 - .033(MOD) + .009(TR\square D) - .333(TFR)$$

Were:

MOD is the modern method contraceptive prevalence among all women 15-49;

TRAD is the traditional method contraceptive prevalence among all women of reproductive age.

According to Westoff (2008), this is the equation that gives the best fit for the data from sub-Saharan Africa where there is a relatively high levels of traditional method use and the TFR is over 3.0 children per woman.

The contribution of each of the principal proximate determinants to fertility change between 1997 and 2003, 2003 and 2011 and 1997 and 2011 was estimated using a five-factor decomposition method proposed by Das Gupta (Das Gupta, 1978, 1993)The five factors include the four indices (sexual activity, contraception, postpartum infecundability and sterility) and a time invariant potential fertility of 21. The index of abortion was not included because it is negligible as is almost equal to one.

The decomposition was performed following the following steps:
Lets R= F(Cx, Cu, Ci, Cf,PF)
Which assumes values

R1= F(Cx1, Cu1, Ci1, Cf1, PF), R2= F(Cx2, Cu2, Ci2, Cf2, PF).

Step 1: to calculate the contribution of change in Cx to the overall change in total fertility rate, first Q is calculated through the following formula:

$$Q = \frac{F(Cx1Cu1Ci1Cf1PF) + F(Cx2Cu2Ci2Cf2PF)}{5} + \frac{F(Cx1Cu1Ci1Cf1PF)+F(Cx1Cu1Ci1Cf2PF)+F(Cx1Cu1Ci2Cf1PF)+F(Cx1Cu2Ci1Cf1PF) +F(Cx2Cu2Ci2Cf2PF)+F(Cx2Cu2Ci2Cf1PF)+F(Cx2Cu2Ci1Cf2PF)+F(Cx2Cu1Ci2Cf2PF)}{20} + \frac{F(Cx2Cu1Ci1Cf2PF)+F(Cx2Cu1Ci2Cf1PF)+F(Cx2Cu2Ci1Cf1PF) +F(Cx2Cu2Ci2Cf1PF)+F(Cx2Cu2Ci1Cf2PF)+F(Cx2Cu2Ci1Cf1PF)}{30} +$$

Where Cx1= Index of sexual activity at time 1
Cu1= Index of Contraception at time 1
Ci1= Index of postpartum insusceptibility at time 1
Cf1= Index of infertility at time 1
Cx2= Index of sexual activity at time 2
Cu2= Index of Contraception at time 2
Ci2= Index of postpartum insusceptibility at time 2
Cf2= Index of infertility at time 2
PF= Potential fertility (21), time invariant.

Step 2: the difference Cx over time (Cx2-Cx1) is calculated;
Step 3: the contribution of Cx to the change in TRF is calculated as
$\alpha = Q * (Cx2 - Cx1)$;
Step 4: the same algorithm was used to calculate the effects of changes in the other indices (Cu, Ci, and Cf) on fertility over time.