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UNIVERSITY OF THE
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ELASTICITY OF MARITAL FERTILITY IN SUB-SAHARAN AFRICA: A DECOMPOSITION ANALYSIS

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A Thesis Submitted in Fulfilment of the Requirements for the Degree of Doctor of Philosophy

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ABSTRACT

Background and problem statement

The question of the determinants of the fertility transitions of countries from sub-Saharan Africa (SSA) has been widely debated in the field of demography. Some scholars have investigated individual-level variables like contraceptive use, delayed age at marriage and participation of women in the labour force. Other scholars have used cultural factors to understand fertility change and patterns in SSA. The breadth of fertility literature includes studies that focused on female variables as well others that examined the role of men in the use of contraceptives. Methodologically, different analytical approaches have been used. These include cross-sectional standard and multilevel regression-based designs and decomposition techniques. However, studies of marital fertility have been few. Furthermore, there has not been a study of marital fertility transition that applied decomposition methods to analyse an age-adjusted indicator of fertility using a vector of determinants including male characteristics. This study was therefore designed to address this gap in the literature investigating the issue of the determinants of marital fertility transition with special attention to quantifying the relative contributions of the various classes of determinants namely proximate, demographic, sociocultural, geographic, female and male background variables. The study derived theoretical underpinning from the model of proximate determinants and the demographic transition theory.

Data and methods

The data for the study were obtained from the Demographic and Health Surveys (DHS) for Ghana, Kenya, Rwanda and Zimbabwe. The four countries were selected firstly on the basis of their geographical location namely Central, East, Southern and West Africa. The second criterion of inclusion was that these four countries have experienced marital fertility transition. This consideration was important for allowing the examination of the determinants of marital fertility declines and stalls. A four-tier analytical suite of quantitative techniques was employed to address the specific research questions. Specifically, this research i) estimated and reconstructed trends of total marital fertility rates (TMFRs) for each of the four countries; ii) conducted statistical tests of trends in TMFRs; iii) estimated adjusted cross-sectional differentials in the levels of TMFRs; and iv) quantified the conditional contributions of the independent variables on the inter-survey decreases and increases in the mean age-specific marital fertility rate (ASMFR). The ASMFRs and TMFRs were estimated using a direct Poisson regression-based estimation approach and the statistical tests of trends were performed using linear regression. The analysis of cross-sectional differentials in marital fertility rates was performed using multilevel linear regression and the quantification of the impact of determinants on temporal marital fertility changes was performed using the threefold Oaxaca-Blinder decomposition technique based on linear regression and was implemented with the option to take into consideration the hierarchical nature of DHS data.

Results

The results of the study showed that all the four countries have experienced marital fertility transition starting in the late 1980s. The transitions of Kenya and Zimbabwe are more advanced with the latter being the first of the four countries to experience a sustained period of decline

in marital fertility rates. The reconstructed trends showed that there has been at least one instance of stalling in all the four countries. The results from multilevel regressions showed that age group, postpartum infecundity and contraceptive use were significant determinants of marital fertility rates. The impact of female variables was more notable for surveys conducted during periods of rapid fertility decreases while that of male variables appeared to explain differences of marital fertility levels in the surveys from periods characterised by stalling. The results from decomposition analyses showed male variables such as education status and desire for more children were the more likely to drive stalls and reversals of the marital fertility transitions in Ghana and Zimbabwe. The major drivers of the marital fertility transitions of the four countries studied were contraception, postpartum infecundity, male occupation, individual-level education of both females and males, and men's desire for children. The changes in the compositional characteristics of the samples by these variables were largely in tandem with the observed inter-survey decreases and increases of marital fertility rates. This implies that the inter-survey differences in the distributions of the samples according to the abovementioned characterised resulted in either significant decrease or increase in the average marital fertility rate, or the lack of notable change in the level of marital fertility.

Conclusion

This study concluded that the elasticity of marital fertility varies across countries; all the determinants investigated have associations with fertility which change over time. The four countries studied are at varying stages of marital fertility transitions. The rates of decrease in marital fertility rates have not been sustained over time as all the countries have experienced stalling at different stages. The understanding of the marital fertility transitions of SSA countries which are mostly patriarchal societies need to consider country contexts and associated epochs, male and female contributions.

Policy recommendations

Based on the results obtained from the study, it is recommended that fertility policies derived from global population management frameworks need to be adjusted to suit prevailing country-specific socioeconomic and demographic conditions. Given that SSA is mostly characterised by pronatalist patriarchal cultural conditions, policy interventions should be targeted at transforming men's attitudes to fertility and not just contraceptive use. Attaining widespread approval of modern methods by men without commensurate downward adjustment in desired family size may not be sufficient to sustain marital fertility decline as was the case in Zimbabwe post-2005. To facilitate shifts towards lower marital fertility rates, countries need to urgently increase the levels of educational attainment of their populations especially at secondary and tertiary levels.

Frontiers for further research

The frontier for further research emanating from this study include the need to investigate the parity thresholds at which husbands begin to prefer less children. It will be important for policy as well as for enhancing the stock of knowledge pertaining demographic change to understand how men's desires for more children are associated with the parity levels of their wives compared to the total number of children including out-of-wedlock children. The other avenue for further research is with regards to two-sex modelling of fertility rates to comprehensively

capture the influence of pronatalist male-dominated cultural contexts on the slow progress of fertility transition in SSA. Furthermore, the growing prevalence of the Pentecostal/Evangelical Christian Orthodox churches, widely known as charismatic churches, need to be investigated in relation fertility transition. This is because religion/spirituality especially that of the charismatic churches has become very integral to the lives of many people in SSA especially the West and Southern subregions. The extent to which these have impacted on the pace of fertility transition can be vital for policies and general understanding of the social transformations affecting demographic change.

LIST OF ACRONYMS AND AABBREVIATIONS

ASFR	Age-Specific Fertility Rate
ASMFR	Age-Specific Marital Fertility Rate
CEB	Children Ever Born
CMR	Child Mortality Rate
DHS	Demographic and Health Survey
DPS	Demography and Population Studies
DTT	Demographic Transition Theory
FTLRP	Fast Track Land Reform Programme
GDHS	Ghana Demographic and Health Survey
HGC	Humanities Graduate Centre
IMR	Infant Mortality Rate
KDHS	Kenya Demographic and Health Survey
RDHS	Rwanda Demographic and Health Survey
SSA	sub-Saharan Africa
TFR	Total Fertility Rate
TMFR	Total Marital Fertility Rate
GDHS	Ghana Demographic and Health Survey
KDHS	Kenya Demographic and Health Survey
RDHS	Rwanda Demographic and Health Survey
ZDHS	Zimbabwe Demographic and Health Survey

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DEDICATION

To my beloved sister, Annah *Kumbirai* Ndagurwa. May your soul rest in eternal peace.

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To the Humanities Graduate Centre and Prof Eric Worby, I express my unrivalled recognition and appreciation for the immense contribution to my development as a Resident Doctoral Fellow and staff member. I derived sustenance socially, economically and academically throughout my time with you. Many Thanks!

I am eternally grateful to you Annah, Morton, Albert, Madeline, Citywell, Watson and Crydon for your emotional support and prayers throughout my educational career to date. Oh, and you too Rudolphine! Tata Man and Mbuya Shamu, you have been immensely helpful to my life throughout my doctoral journey; May God bless you too. To my parents, Fennie Barbara Ndagurwa nee Nyazika and Leonard 'Lenzo' Ndagurwa, to whom I owe my upbringing, I express my infinite and most humble gratitude.

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Lastly, I find this new, trending thing in the digital social platforms whereby the common, anonymous being, mostly young, highlight the recognition of famous people for their inspiration. I tend not to be immune from this; so I wish to thank the former president of Zimbabwe, Robert Gabriel Mugabe, who once waved at me when the convoy of his expensive motorcade motored through a procession to one of his 21st February movements, screwing up traffic in those underdeveloped narrow roads for no less than a full hour which forced me to kill time by pondering an escape from the vices of that country's life, for inspiring me to pursue my doctoral studies out of my country.

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DECLARATION

I, Pedzisai Ndagurwa……, student number…993183……., declare that;

1. The research reported in this thesis, except where otherwise indicated, is my original research.

2. This thesis has not been submitted for any degree or examination at any other university.

3. This thesis does not contain other persons' data, pictures, graphs or other information, unless specifically acknowledged as being sourced from other persons.

4. This thesis does not contain other persons' writing, unless specifically acknowledged as being sourced from other researchers. Where other written sources have been quoted, then:

a) Their words have been re-written, but the general information attributed to them has been referenced

b) Where their exact words have been used, then their writing has been placed inside quotation marks and referenced.

5. This thesis does not contain text, graphics or tables copied and pasted from the Internet, unless specifically acknowledged, and the source being detailed in the thesis and in the References sections.

Signed



……

BIOSKETCH

Pedzisai Ndagurwa is a demographer and population scientist who works as Population Surveillance Manager (PSM) at the MRC/Wits-Agincourt Unit, a Health and Demographic Surveillance System (HDSS) situated in Bushbuckridge South Africa under the School of Public Health, Wits University. In his role as the PSM, Pedzisai is responsible for running the Agincourt Health and Population Unit (AHPU) census collection which involves a team of 50 fieldworkers, supervisors, drivers, project coordinator and laboratory technician. The AHPU census is being synchronised with those from the other two existing HDSS sites from South Africa to create a South African Population Research Infrastructure Network (SAPRIN), an initiative of the Department of Science and Technology with the aim of generating a longitudinal database platform for scientific inquiry that will help policy formulation for the South African government.

Pedzisai enrolled for his full-time PhD in the department of Demography and Population Studies (DPS), Wits University in May 2015 and has served the department in various capacities. For instance, in 2015-2016, he was Project Coordinator of the Gauteng State of the Population Research Report, in which he co-authored 3 chapters, undertaken by DPS for South Africa's Department of Social Development. Pedzisai was also part of the DPS team that undertook programme evaluation for the United Nations Population Fund in 2017. For the period 2017-2018, he was serving as sessional lecturer delivering lectures to honours and masters classes on Basic Demographic Methods in Fertility and Mortality, and Introduction to Population Studies. The fertility lectures covered measures of fertility rates, estimation and application of the proximate determinants indices while mortality lectures pertained single and multiple decrement lifetables.

Besides his involvement in DPS, Pedzisai was a member of staff of the Humanities Graduate Centre (HDC) for the 2016-2018 period. The HGC is a centre of the Faculty of Humanities which focuses on fostering postgraduate and early career research development to which Pedzisai's main contribution was the introduction of software training for qualitative research as a response to the needs of the great majority of postgraduate students in the faculty.

In terms of publications, Pedzisai has published 2 articles in 2019 from his PhD thesis in the Journal of Population Research and Genus under the titles *Decomposition of Zimbabwe's stalled fertility change: A two-sex approach to estimating education and employment effects*; and *The elasticity of marital fertility in three sub-Saharan African countries: A decomposition analysis* respectively. He also has 2 articles drawn from his PhD which are to be presented at the 2019 Population Association of America and these are *Marital fertility transition in patriarchal Ghana: The falls, the stalls and the drivers*; and *Small area estimation of fertility: comparing the 4-parameters Own-Children Method and the Poisson regression-based person-period approach*; with the latter going on to be published in the journal Demography.

In other research unrelated to his PhD, Pedzisai has co-authored 1 journal article titled *Cohabitation in sub-Saharan Africa: A regional analysis* which was published in the Southern African Journal of Demography in 2018. Prior to joining Wits University, he had written 1 book chapter from his masters dissertation titled *The impact of family structure on schooling*

outcomes for children in South Africa in 'Children in South African Families: Lives and Times', a book which was eventually published in 2016 following an almost 2-year processing delay. Currently, he has co-authored a chapter *Family changes and childbearing in sub-Saharan Africa* in an edited volume 'Family Demography In Africa And Post-2015 Development Agenda' by Prof Clifford Odimegwu, published in 2019. He is currently working on various papers on education, family demography, and fertility all focused on understanding the demography of African populations on the subcontinent.

With respect to his doctoral thesis, Pedzisai sought to the apply the regression-based Oaxaca-Blinder decomposition technique in a two-sex empirical modelling framework in the study of marital fertility transitions of sub-Saharan African (SSA) countries, focusing on the cases of Ghana, Kenya, Rwanda and Zimbabwe. The thesis titled ***Elasticity Of Fertility In Sub-Saharan Africa: A Decomposition Analysis*** had the goal of understanding the temporal marital fertility responses to the forces of changing characteristics and reproductive behaviour cross-sectionally and over time. The findings of the thesis highlighted the complexity of marital fertility in SSA, that the role of proximate and background determinants vary across countries and over time within countries. The findings also showed notable contributions of men, and by extension patriarchy, on reducing the pace of marital fertility decline. Based on his thesis, Pedzisai posits that given the level of socioeconomic development in many SSA countries, it is imperative that to achieve optimum results from fertility management policies, countries need to desensitise the pronatal aspects of patriarchy through increasing secondary and tertiary education coverage in their populations and fostering faster economic development. Failure to do so will potentially result in more instances of stalled fertility transitions and further delays in achieving sustainable population growth.

CHAPTER 1 : INTRODUCTION TO THE STUDY

1.1. Background of the study

The total population of sub-Saharan Africa (SSA) more than quadrupled in just over five decades, increasing from a mere 180 million in 1950 to almost 770 million by the year 2005 (Bongaarts, 2009; Bongaarts and Casterline, 2013). This implies that the SSA population grew an annual rate of six percentage points. During the 2010-2015 period, scientific estimates suggest that the annual growth rate of the SSA population was 2.5%, a considerably high and unsustainable growth rate given the slow socioeconomic development on the subcontinent (Bongaarts and Casterline, 2013; Population Reference Bureau, 2015). Currently, the 2018 mid-year estimate shows that the subcontinent is now populated by 1.28 billion people with an average regional total fertility rate (TFR) of 4.6 births per woman (Population Reference Bureau, 2018). This TFR highlights that the main driving factor of the high annual rates of population growth that have been observed in SSA is high fertility and has been complemented by declines in mortality rates (Bongaarts et al., 1984; Ekane, 2013).

According to Mabogunje (1995), the end of the colonial period in the region saw many governments expanding social services especially in the areas of primary healthcare and education. This significantly increased survivorship of children to adulthood leading to increased momentum of population growth even when average regional fertility rates were declining starting in the 1980s (Mabogunje, 1995). When fertility levels are above replacement, indefinite population growth occurs (Andreev et al., 2013; Preston et al., 2000). In SSA, regional average fertility rates above 6 births per woman during much of the 20th century in the context of positive gains in survivorship led to increased rate of population growth thereby

raising concerns about the negative implications of uncontrolled population growth on the socioeconomic developmental prospects of the region (Drechsel et al., 2001).

High population growth increases demand on available resources, contributes to deforestation, environmental degradation and impacts negatively on socioeconomic development thus contributing to perpetuating poverty and inequality (Be-Ofuriyua and Emina, 2002; Drechsel et al., 2001; Eloundou-Enyegue and Giroux, 2013; Eloundou-Enyegue and Williams, 2006; International Labour Organisation, 2015; Mabogunje, 1995). This is because high fertility is mostly concentrated among the less educated and poor segments of populations, thus works to increase the proportion and absolute size of these categories in a country (Zuberi and Thomas, 2012). The imbalance between population growth and development in SSA became a concern for African governments the majority of which became interested in finding effective policies to reduce birth rates as a way of combating population growth (United Nations Economic Commission for Africa, 1984).

Starting in the 1960s, many governments from the Anglo SSA began to acknowledge the need for fertility control and thus began to adopt family planning programmes aimed at reducing birth rates in order to combat the threat paused by population growth as well as to enhance people's standards of living and socioeconomic development (Chimbwete et al., 2005; Cleland et al., 2006; Rutayisire et al., 2014). Meanwhile, there was growing interest among demographers and scholars from other disciplines in establishing a comprehensive understanding of the cultural, environmental, socioeconomic and biological determinants of fertility in SSA partly to aid effective policy making and implementation (Bongaarts et al., 1984). However, early studies of the determinants of fertility in SSA were constrained by lack

of reliable data, a limitation that was partially addressed by the advent of the World Fertility Surveys (WFS) and subsequently the Demographic and Health Surveys (DHS) (Caldwell, 1973; Ezeh and Dodoo, 2001; Gille, 1987).

In the absence of evidence of fertility decline, pioneering studies of fertility in SSA sought to determine the factors supporting high fertility regimes on the sub-continent (Boserup, 1985; Caldwell, 1977; Caldwell and Caldwell, 1987). These studies found that the mode of production, religious belief systems and the general pronatal patriarchal cultures of African societies provided strong supports for high fertility (Boserup, 1985; Caldwell, 1977; Okediji et al., 1976). According to Caldwell (1977), the rationality of high fertility in places like the Western and Lagos States of Nigeria could only be understood within the context of prevailing social structures because the economic ends of the populations were determined by social ends. Given that the social ends of the African societies were predicated on large families sustained through high fertility, economic sustenance also depended on the strength in numbers of social ties (Caldwell, 1977; Okediji et al., 1976). There were similar findings observed in other studies based on West African populations by Caldwell and Caldwell (1990) and Boserup (1985).

The lack of modernisation in the means of subsistence was also a factor supporting high fertility rates in SSA societies. According to Boserup (1985), lack of indigenous urbanisation meant that emerging urban centres mainly served immigrant populations of European and Asian origin without affecting the subsistence mode of production of Africans. The fertility inhibiting effects of urbanisation therefore did not reach the African indigenous populations whose livelihoods continued to be based on subsistence mode of production (Boserup, 1985). When education was introduced, the associated costs were inconsequential as parents only educated

the first one or two children who would then be responsible for the education of younger siblings (Okediji et al., 1976). In Southern Africa, labour migration as a result of urbanisation was observed to have a depressing effect on fertility levels especially among married women (Lesthaeghe, 1984). This was why this region was the first to experience fertility transition among it African populations because of increased contact with urban livelihoods and effects of migration.

The pioneering studies of fertility such as Boserup (1985), Caldwell (1977), Caldwell and Caldwell (1987) and Okediji et al. (1976) among others situated the determinants of fertility at the community level, suggesting that fertility decisions in SSA societies were primarily outside the locus of nuptiality. However, the emergence of reliable large-scale survey data like WFS and DHS partly influenced the shift in the research focus from mainly societal/community-level to individual-level determinants and the treatment of individuals as units of analysis. According to Pullum (1987), the WFS and availability of public use data in the 1970s and 1980s complemented by relevant adaptations of multivariate statistical modelling techniques facilitated the shift from aggregates to individuals as appropriate units of analysis in fertility studies. The emergence of better quality DHS data in SSA as indeed in other continents cemented the focus on individuals as units of analysis and individual-level determinants in fertility research on the sub-continent (Ezeh and Dodoo, 2001; Poston and Micklin, 2006). This did not however imply complete exclusion of community-level factors from the research scope of fertility determinants. The WFS collected data on community variables such as availability of schools, family-planning services, communication and transport infrastructure and these variables were used to investigate fertility changes (Casterline, 1987).

The availability of reproductive and family-planning health centres was identified to be an important determinant of fertility change in SSA (Freedman, 1987). However, most studies of community-level determinants of fertility based on WFS data found limited evidence to support the importance of such variables in explaining the decline of fertility (Freedman, 1987). This was because the WFS did not collect data about usage of the community infrastructures resulting in some scholars concluding that the WFS was not appropriately designed to investigate community-level effects on fertility change (Casterline, 1987). Following the issues that arose from WFS community data, Blalock (1984) suggested that average levels of access and use of social infrastructures like schools, hospitals and clinics should be used as community-level predictors instead of the mere presents or absence of the respective infrastructure.

Despite the data quality issues of WFS, evidence based on the surveys showed that population control in the form of family planning programmes played a significant role in the onset of fertility transition especially in countries from Latin American and Asia (Tienda, 1983). Studies based on data other than WFS also found that family planning programmes were instrumental in the fertility transitions of countries from SSA with the first declining trends emerging in Southern Africa in the 1970s followed by countries from East Africa and later by those from Central and West Africa (Bongaarts, 2009; Lesthaeghe, 2014). The emerging trend of fertility transition in several SSA countries attracted attention from demographers and scholars from other disciplines who were interested in understanding and explaining the downward trend in birth rates. This led to the interest in understanding why fertility declines over time in the African continent, a line of enquiry that had already been well established in

the other continents namely Europe, North America, Latin America and Asia because they had already experienced fertility transitions.

Scholars investigating the determinants of fertility decline in SSA identified an array of important factors to explain the downward trend in the total fertility rates of countries from SSA particularly those from the East and Southern sub-regions. Past studies have identified the increased average age at first marriage (union), increased access to education, modern contraceptive use and women's participation in the labour force as some of the driving factors of fertility transition in SSA (Bundervoet, 2014; Shapiro and Gebreselassie, 2013; Garenne and Joseph, 2002; Kravdal, 2002; Ainsworth et al., 1996; Bongaarts et al., 1984). Despite the valuable knowledge generated from these past studies, it is worth noting that they mostly employed cross-sectional research designs which are more suitable for explaining differences in fertility levels at one point in time. These studies were mostly underpinned by fundamental theoretical postulations from the demographic transition theory (DTT), ideational change theory and Bongaarts' (1978) model of proximate determinants.

There was widespread anticipation that all SSA countries led by those from Southern Africa were going to join the fertility transition in a continuous downward trend towards replacement level (Caldwell and Caldwell, 2002). However, evidence began to emerge in the first decade of the 21st century suggesting that several countries that had started the fertility transition were experiencing stalling (Machiyama et al., 2010; Garenne, 2010; Shapiro and Gebreselassie, 2013; Bongaarts, 2008). The concept of fertility stalling describes a situation when the TFR of a defined population ceases to decline, remains constant, negligibly decreases or increases over

a period of time after a country had been on a transitional path (Garenne, 2011; Howse, 2015; Shapiro and Gebreselassie, 2013).

The full extent fertility stalling and the underlying drivers has been a contentious subject among scholars (Moultrie et al., 2008). There are scholars like Schoumaker (2009) who have disputed the occurrence of stalling in some of the instances regarded as such while Goujon et al. (2015) have argued that there has been a lack of a plausible common explanation of stalling in the existing literature. Nonetheless, the study by Bongaarts (2006) which investigated the causes of stalling found that the levelling off in a number of determinants like the demand for and use of contraceptives as well as the number of wanted births emerged as distinguishing features of stalling periods. However, the focus of the study by Bongaarts (2006) was not necessarily to quantify the role of each determinant in the stalling of fertility transitions although its findings were insightful. The occurrence of stalling once fertility transition has started raises the question of why the fertility transitions of many countries from SSA have been characterised by falling, stalling and resumptions of the fertility decline. Some of the answers to this question can be obtained from the existing body of fertility literature but one will inevitably acknowledge that the current state of knowledge may not be sufficient for a full account of why most SSA countries have experienced fluctuations in fertility transitions.

1.2. Problem Statement

The past studies by scholars such as Kravdal (2012, 2002), Ezeh and Dodoo (2001), Caldwell and Caldwell (1987) and Caldwell (1977) established the significance of context and community-level factors on the levels of fertility in countries from SSA. Other scholars found that the fertility regimes in SSA countries have properties of social organisation that include

cultural and religious belief systems that cannot be easily altered by economic development (Agadjanian and Yabiku, 2014; Ekane, 2013; Mbacké, 1994). Similarly important findings from previous studies pertained to the significant role of individual characteristics in explaining differentials in the fertility rates of women at any given point in time (Lindstrom et al., 2009; Lindstrom and Woubalem, 2003; Madhavan and François, 2013; Shapiro and Tenike, 2015). Research on the role of individual characteristics has also been extended to gender inequalities and women's experiences of gender-based violence as scholars investigated how these factors were associated with cumulative fertility and fertility intentions among women in SSA (Odimegwu et al., 2015; Odimegwu and Adedini, 2014). However, there are some gaps in the current body of fertility literature especially when addressing the question of the drivers of the temporal changes in the TMFRs of countries from SSA. These gaps emanate from the tendency of past studies to analyse data with a view to understand TFRs and not necessarily TMFRs, to treat cumulative fertility as a proxy indicator of TFRs thus by extension TMFR, the treatment of findings from standard cross-sectional designs as reflective of drivers of fertility change, and to some extent giving more focus on variables derived from data about women only (Goldscheider and Kaufman, 1996; Greene and Biddlecom, 2000). To summarise the gaps, this thesis was designed to address the lack of literature on marital fertility transition, the lack of studies on fertility transition based on age-adjusted measure consistent with TMFRs, the lack of studies employing decomposition methods with a temporal orientation, and the lack of studies of fertility rates incorporating both male and female characteristics. The following paragraphs elaborate on these gaps based on past scientific literatures.

Some of the studies on fertility in SSA employed standard regressions estimating cross-sectional differentials in fertility (Ainsworth et al., 1996; Kravdal, 2012, 2002). The benefit of these studies is that they provide valuable knowledge about the distribution of fertility across

groups of women. However, cross-sectional regressions alone are limited in their ability to quantify the contributions of different factors to the temporal decreases or increases of fertility. For instance, the studies by Kravdal (2012, 2002) and Ainsworth et al. (1996) found that education status was a significant determinant of the fertility levels of women in many SSA countries. However, Garenne (2008a) established from his examination of trends in TFRs by education status that temporal changes in fertility levels of the different categories of education status were mostly parallel. Consequently, one can question the status of education in driving the fertility trends that have prevailed across SSA countries. An investigation of the drivers of marital fertility transitions of selected countries from the region can contribute to addressing this gap arising from reliance on cross-sectional regressions to understand fertility change over time. A full appraisal of the drivers of marital fertility transitions in SSA countries using analytical techniques that capture sources of fertility changes, building on the existing knowledge from cross-sectional research findings, is therefore imperative.

There are past studies that applied decomposition techniques to investigating sources of fertility changes in the SSA context (Burger et al., 2012; Lindstrom and Woubalem, 2003; Owoundi, 2014; Rutayisire et al., 2014). These studies have their strengths and limitations when one wants to apply the knowledge generated from them to explain the drivers of marital fertility transitions. The studies were not necessarily designed to investigate the drivers of temporal changes in marital fertility rates as they were concerned rather with fertility rates of all women and some outcome variables that are not consistent with measure of TFRs. The study by Rutayisire et al. (2014) investigated the changes in fertility between 2000 and 2010 in Rwanda based on DHS data using the occurrence of pregnancy as an indicator of actual fertility. This approach has associated problems emanating from the fact that it overlooked one of the important proximate determinants, induced abortion. Actual fertility may not be reflected in

the numbers of pregnancies. As found from the study by Basinga et al. (2012), the abortion rate for Rwanda based on the 2010 Rwanda DHS was 25 per 1,000 women. A decomposition of fertility change based on pregnancy status may not be sufficient to generate full knowledge about the sources of marital fertility changes.

The study by Lindstrom and Woubalem (2003) which employed a decomposition method was restricted to demographic factors only and focused on the Ethiopian capital Addis Ababa which has been found to have a unique fertility regime compared to the other parts of that country. The contributions of the socioeconomic, social and geographic factors to the temporal changes in fertility rates were not estimated. In another study that also applied decomposition techniques, Owoundi (2014) investigated the TFR changes in Lesotho, Namibia and Zimbabwe but the range of predictor variables was restricted to women characteristics only and excluded those of men. Burger et al. (2012) also excluded male characteristics in their decomposition of the fertility transition of South Africa. While these studies produced valuable knowledge about determinants of fertility changes, the exclusion of male variables is a gap in fertility decomposition literature that needs to be addressed.

There are past studies that employed two-sex modelling to investigating fertility outcomes of women, generating valuable knowledge about men's role in reproduction in countries from SSA (Dodoo, 1998, 1993; Dodoo et al., 1997; Dodoo and van Landewijk, 1996). The study by Dodoo (1993) applied a couple-model in analysing the 1988 Ghana DHS to examine men's role in the usage of family planning, concluding that the individual motivations of males towards childbearing had the greatest potential to impact to fertility transition. Other studies on Ghana by Dodoo and Landewijk (1996) and Dodoo et al. (1997) as well as on Kenya by Dodoo (1998) corroborated earlier findings from Dodoo (1993) regarding male reproductive

preferences being more correlated with contraceptive use than women's. These findings provide a platform for asking further questions regarding the determinants of marital fertility changes. If men were found to wield greater influence on reproductive behaviour, questions on their contributions to the marital fertility trends since the beginning of fertility transitions need to be addressed through applying appropriate multivariate modelling techniques to the right outcome variables.

A review of the pertinent literature above reveals three main strengths of the existing studies that can be harnessed to bolster a systematic analysis in one study of the marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe. These strengths relate to two-sex modelling, application of decomposition methods, and analysis of the age-adjusted indicator of marital fertility. A methodological approach that responds to these three aspects can address the gaps in the existing body of fertility literature by leveraging on the knowledge from studies while being robust to limitations inherent in the past approaches. Two-sex modelling has the benefit of estimating adjusted effects of female and male variables in a single multivariate analytical framework while at the same time measuring the relative roles of proximate versus indirect determinants.

The estimation of the relative contributions of the proximate and indirect determinants on temporal fertility changes in a single model is vital for understanding spatial variability in fertility determinants. This is because while proximate determinants have been widely regarded as the crucial factors driving fertility change, there have been instances when fertility changes were not in accordance with changes in proximate determinants. In some of the countries from SSA like Burkina Faso, Zambia and Zimbabwe, proximate determinants such as contraceptive use and non-marriage increased over time especially after the turn of the 21st century but with

little effect on fertility levels (Johnson et al., 2011). In countries such as Senegal, Madagascar, Rwanda, Cameroon and Ghana, fertility decline was not associated with changes in the proximate determinants which either remained constant or changed in contradicting directions (Johnson et al., 2011). Given the observed inconsistent associations between changes in proximate determinants and fertility rates, there is a need to also estimate the role of the so-called indirect determinants of fertility. The application decomposition analysis including background variables enhances the platform for understanding why fertility would not respond to proximate determinants.

1.3. The Purpose Statement

The purpose of this study was an empirical application of a decomposition method in a multivariate analysis of the temporal elasticity of marital fertility in Ghana, Kenya, Rwanda and Zimbabwe. The term decomposition refers to the act of separating a variable into its constituent parts (The International Statistical Institute, 2003). In the current study, decomposition describes the act of quantifying the conditional impact of changes in the compositional characteristics of a sample and coefficients on the average age-specific marital fertility rate (SAMFR) fertility a measure of TMFR. Decomposition methods provide a framework for investigating disparities between groups (The International Statistical Institute, 2003). The groups can be from two surveys conducted in the same country at different time periods or similar surveys conducted in different countries at the same time. For example, decomposition techniques can be applied to the study of the effects of determinants on fertility decline using two waves of DHS data from one country, or to identify factors responsible for differences in the fertility levels between two countries. Decomposition methods like the Oaxaca-Blinder technique as applied in fertility research quantify the conditional contributions

of changes in the characteristics of populations to the observed total change in the level of fertility (Romo, 2003). In the current study, the aim of applying decomposition methods was to quantify the magnitude of increase or decrease in the average age-specific marital fertility rate (ASMFR) of a country that would have accrued from compositional changes as well as shifts in the fertility returns to characteristics. The computed conditional changes in the mean ASMFR also indicated the sources of the marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe.

The term elasticity is widely used in the field of economics to refer to the amount of change in the volume of demand for a product due to an increase or decrease in price (Andreyeva et al., 2010; DeCicca and Kenkel, 2015). However, the concept of elasticity has not been restricted to the field of economics alone as it has also been explored in the fields of mathematics and physics. In the Mathematical Theory of Elasticity, the focus has been on the calculation of the relative displacement or shift in an object whose properties are variable due the actions of equilibrating forces from external stimuli. In demographic literature, scholars like Lesthaeghe (1984) used the term elasticity to refer to the responsiveness of proximate determinants of fertility to the forces of cultural, economic and social changes. The current study applies the term elasticity to refer to the magnitude of temporal decrease or increase in the level of marital fertility rates due to changes in sample distributions and changes in the fertility returns to identified individual and community-level characteristics.

The dependent variable for the study was the marital fertility rate measured as the mean of ASMFRs. The independent variables were classified into proximate determinants, female characteristics, male endowments, demographic and socio-geographic factors. The proximate

determinants were contraceptive use, postpartum infecundity and abortion. The variables that were classified by sex (female and male) were education status, occupation, community-level average educational attainment and desire for children. The demographic variables were infant mortality rate (IMR), child mortality rate (CMR) which was also referred in other instances as under-5 mortality rate (CMR) and age group. The category of socio-geographic variables included household socioeconomic status (SES), religious belief systems and rural-urban residence. The full description of the specific variables for each of the categories is provided in Table 3.1 under section 3.8 of Chapter 3.

1.4. Research Questions

1.4.1 General research question

The general research question was; 'What are the sources of temporal changes in marital fertility in countries from SSA?'

1.4.2 Specific research questions

The study aims to answer the following research questions;

i. Have the TMFRs of Ghana, Kenya, Rwanda and Zimbabwe declined over time?
ii. How do the timing and progress of the marital fertility transitions of the four countries compare?
iii. To what extent do male variables explain marital fertility differentials in Ghana, Kenya, Rwanda and Zimbabwe over time?
iv. What have been the relative contributions of male and female variables to the marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe?
v. What have been the drivers of the marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe?

1.6 Definitions and Delimitations

Elasticity of fertility: Amount of change in (responsiveness of) the level of fertility attributable to change in an identified variable.

Decomposition: The act of estimating and quantifying the amount of change in the mean of ASMFRs that would occur due to changes in composition of the sample and fertility returns to compositional characteristics.

Female variables: Socioeconomic characteristic that pertains to women.

Male variables: Socioeconomic characteristic that pertains to men.

Fertility stalling: When the TMFR of a country remains the same, declines negligibly or increases between two successive surveys.

Fertility transition: Sustained downward change in the total fertility rate of a country.

Two-sex modelling: The analysis of an outcome variable whereby the independent variables are drawn from both men and women. The concept of two-sex modelling is not novel and was explored by other scholars in the past. An example is Fried et al. (1980) who comparatively explored parity-specific, wife-only, husband-only and two-sex utility models.

1.7 Significance of the Study

The significance of this study is that two-sex modelling of fertility changes with the application of decomposition methods is crucial in building more rounded understanding of the drivers of past and present trends in marital fertility in the context of SSA. An understanding of the drivers of marital fertility changes can enhance the theoretical understanding of fertility in the region. Furthermore, the findings from this study can provide vital knowledge that can enhance the programming of fertility management policies for promoting marital fertility decreases to sustainable levels.

The import of this study is also in relation to its inclusion of male correlates in the modelling of temporal changes in marital fertility rates. The inclusion of these variables demonstrates the capacity of demographic research to emerge from the implicit view contained in the majority of past studies regarding women as producers of the population problem of high fertility as reflected in the publicised recommendations for reduction of women's fertility (Hartmann et al., 2012). Given that men have been observed to be open to change in the face of perceived socioeconomic advantages, including male characteristics in the study will provide a platform for policy avenues aimed at targeting changing men's attitudes towards low fertility. When sufficient proportions of men view low fertility to be advantageous, it will be easier have high rates of use of modern contraceptives for fertility limitation and not merely for birth spacing. Furthermore, the examination of male variables puts the spotlight on patriarchal context which can potentially inspire the design of policies that seek to improve societal attitudes towards low fertility and how this has implications in the health of women.

This study is also significant in that its findings have a bearing on the chances of countries from SSA achieving several of the Sustainable Development Goals (SDGs). Although no specific mention of fertility management is made in the SDGs framework, knowledge crucial to realising the first goal (no poverty), goals 3 to 5 (good health and wellbeing, quality education, and gender equality respectively) and goal number 8 (decent work and economic growth) can be deciphered from the findings of this research. If marital fertility does not decline, the false façade of low fertility derived from TFR estimates in contexts of delayed marriage will give the false impression that population growth will be curbed. This is especially

in cases of ever married proportions by the 50th birthday among women continue to be high in a country.

1.8. Organisation of the thesis

This thesis comprises 9 chapters which are connected by the singular intent to demonstrate the elasticities of the marital fertility rates of Ghana, Kenya, Rwanda and Zimbabwe. The 10 chapters are described chronologically below.

Chapter 1: This is the introduction to the study. As encountered above, it lays out the current state of research and knowledge about fertility in SSA, its determinants and potential gaps in the existing literature. Chapter 1 also discusses the problem to be explored in the study, the purpose of the study and sets the tone for all the subsequent chapters.

Chapter 2: Presents a critical review of the pertinent literatures. It looks at what is known from previous studies regarding marital fertility and fertility in general with greater focus on SSA. Chapter 2 expands on the brief overview of the existing literature which was presented in Chapter 1 for purposes of delineating the need for a study on marital fertility transitions. Chapter 2 also presents the theoretical frameworks that informed the general approach to the entire study. It also describes the conceptional framework which operationalised the ideas obtained from the existing theories.

Chapter 3: This provides the methodology of the thesis, detailing the empirical steps undertaken to address the research questions. It also describes the source of the data and sample as well as discussing the suitability of the methods of analysis in relation to these data.

Chapter 4: The first of 4 chapters presenting results. It describes the sample of the study including how for each country the distribution of married women by various independent factors changed over time. Besides serving the general purpose of communicating the sample

structure for the study, the contents of Chapter 5 lay the platform for the interpretation and understanding of the decomposition results presented in chapter 8.

Chapter 5: Addresses the first specific research question by presenting the results on the trends of TMFRs and TFRs. As already stated, TFRs are presented to provide the context of the general fertility transition in the four countries. It also provides a comparative analysis the transitions in the marital fertility rates of Ghana, Kenya, Rwanda and Zimbabwe which was the subject of the second specific research question/objective.

Chapter 6: This chapter addresses the third specific research question. It presents the results from multilevel random effects regressions which estimated the cross-sectional differentials in individual marital fertility rates.

Chapter 7: This chapter presents results from decomposition analysis and aims to provide a response to the fourth specific research question/objective. The focus of the chapter is on the drivers of marital fertility changes, and it also highlights the factors with the greatest potential to increase the pace of marital fertility transition.

Chapter 8: This is the discussion chapter. It locates the findings of the thesis within the broader body of literature on fertility.

Chapter 9: The last chapter of the thesis. It provides a summary of the thesis, draws a conclusion for the study provides recommendations.

CHAPTER 2 : LITERATURE REVIEW

2.1. Introduction

The preceding chapter has already provided a general synopsis of the current knowledge pertaining the temporal change in the fertility rates of countries from SSA. This chapter conducts a more detailed critical review of the existing literature on fertility transitions and the associated determinants. In reviewing the existing studies, the chapter shades light on the gaps in the body of literature in relation to understanding the marital fertility rates and their transitions in SSA countries. This helps to situate the issues raised in the problem statement within the existing body of literature. This chapter contains three sections. The first section reviews global literature and the second section focuses on the literature from SSA. The section reviewing SSA literature also covers a dedicated review of studies that have incorporated male variables in their analyses of fertility determinants. The third section summarises the gaps in the literature and conclusion is drawn to round off the chapter.

2.2. Global literature

Many studies of fertility in SSA have engaged research from western Europe and other regions of the world. The rationale for this practice is to learn from the observations from those regions since they have all gone through the fertility transitions currently taking place in SSA. The expectation is to hypothesise whether the patterns of fertility transition observed in the other regions like Europe, North America, Asia, South America will prevail in SSA (Bongaarts and Casterline, 2013; Van De Walle and Knodel, 1980; Watkins, 1987). Furthermore, the history of colonialism, the emergence of globalisation and the attendant diffusion of western cultural and reproductive values affecting fertility are also a component of the rationale for reviewing global literature for a study situated within SSA.

The global body of literature carries that fertility transition first occurred in Europe west of the Hajnal line and the United States of America (USA) in the early 19th century (Coale and Treadway, 1986; Hirschman, 1994; Sanderson, 1987). The Hajnal line was named after John Hajnal who discovered in 1965 that the nuptiality patterns of Europe differed notably between the eastern and western regions (Hajnal, 1965). The first European countries to experience fertility transition were France, Switzerland and England (Murphy, 2015; Perry, 2014). The fertility levels in Europe before the transition were largely between 4 and 5 births per woman (Coale and Watkins, 1986; Watkins, 1987). According to Yaukey et al. (2007), the fertility transitions of the pioneering countries were mostly Malthusian and neo-Malthusian, implying that they were driven by delays in age at first marriage and reductions of marital fertility. Consequently, the expectation for SSA before fertility transition was that the delay in marriage would have a similar effect on fertility transition. In the other parts of the world namely East Asia and Latin America, fertility transition started in the 1950s (Casterline, 1991; Cleland, 2001; Rosero-Bixby, 1996; Spoorenberg and Gerland, 2013).

The existing studies have identified and argued for different classes of factors as having led to fertility transition particularly in the pioneering regions of Western Europe and North America. Some studies have supported the economic perspective which argue that industrialisation which was centred in England drove fertility decline (Becker et al., 2010; Galor, 2012). The study by Becker et al. (2010) analysed pre-transition census data from Prussian counties and showed that education of young girls from the 1850s cohorts predicted the onset of the Germany fertility transition in the 1880-1905 period. According to Galor (2012), the process of industrialisation increased the demand for human capital which in turn encouraged people to seek skills through education, adjusting down their reproductive costs (time) thus resulting the fertility transition.

However, studies like Coale and Watkins (1986) and Perry (2014) have argued that ideational change mediated by linguistic and cultural linkages was the main factor underlying the onset of fertility decline in Europe. Furthermore, González-Bailón and Murphy (2013) and Spolaore and Wacziarg (2014) also found evidence to suggest that the onset of fertility transition followed cultural patterns instead of industrialisation. This is because the first communities to experience falling birth rates were found in unindustrialised France and in relatively poor regions where inequality was low (Lindert and Williamson, 2012). Fertility transition did not start in the more industrialised England nor the wealthiest *depártments* in France (Cummins, 2013; Murphy, 2015). Other studies reported that there were interactions between industrialisation and changes in socio-cultural factors (Anderson, 1986; Coale, 1973; Lesthaeghe and Wilson, 1986). These studies provide a knowledge base for hypothesising marital fertility transition in SSA where most of the countries are former colonies of European nations which affected the cultural, economic, political and social organisation of indigenous population groups.

2.3. Literature from sub-Saharan Africa

The SSA region started to experience fertility transition in the 1980s, about forty years after the other developing regions Latin America and Asia started experiencing fertility declines (Ekane, 2013; Malmberg, 2008). According to United Nations Population Division (UNPD) (2015), the average regional TFR for SSA declined from 6.6 births per woman in the 1950-1955 period to 5.1 births per woman in the 2010-2015 period. This represents a regional decline in TFR of 22.7 percent over a sixty-year period. However, there were marked sub-regional differences in the levels of fertility rates and the pace of transitions.

The first countries to experience decreases in fertility were predominantly from Southern Africa where the transition started in the 1960s in South Africa followed by Botswana, Zimbabwe, Swaziland, Lesotho and Namibia (Blanc and Rutstein, 1994; Caldwell et al., 1992; Garenne and Joseph, 2002; Jeon et al., 2010; Kirk and Pillet, 1998; Muhwava and Timaeus, 1996). In the East Africa sub-region, Kenya, Tanzania and Rwanda were the leading countries while in West Africa it was Cote d'Ivoire and Ghana (Cohen, 1998; Ezeh and Dodoo, 2001; Kirk and Pillet, 1998). Fertility transition in Central and West Africa, with the exception of Cape Verde, has been hesitant and lags behind the other two sub-regions (Lesthaeghe, 2014). The delayed onset of fertility transition in Central and West Africa was attributed to falling rates of infertility which were high during the 1970s and 1980s in countries found in the region like Cameroon and southern part of Nigeria as reported in Frank (1983), Sala-Diakanda et al. (1981), Larsen (1985), Caldwell and Caldwell (2002), and Larsen and Raggers (2001). It was only until the 1990s that a declining trend in fertility emerged in the Central and West sub-regions of SSA amid a broader context of fertility transition in the developing world (Bulatao and Casterline, 2001; Cohen, 1998; Garenne and Joseph, 2002; Shapiro and Tambashe, 2002). There has not been scientifically established evidence to suggest that the onset of fertility transition in the countries from SSA followed linguistic and culturally linked spatial lines like that of Europe. As noted in Tsui et al. (2017), the SSA region is characterised by a large number of ethno-linguistic clusters which may have contributed to limiting ideational transmissibility of fertility behaviour such that the widespread of birth control ideas was only possible after the introduction of mass media infrastructure.

According the 2015 revision of World Population Prospects, TFR of Southern Africa declined from 6.3 births per woman in 1960 to 2.5 in the year 2015, a decline of 60.3% in 55 years (UNPD, 2015). During the same period, the East Africa sub-region experienced a decline in

TFR of 30 percent, from 7.0 births per woman to 4.9 births per woman (UNPD, 2015). In Central and West Africa sub-regions, declines in TFRs were from 6.1 and 6.4 in 1960 to 5.8 and 5.4 in 2015 respectively (UNPD, 2015). The declines in TFR for Central and West Africa were thus 4.9 and 15.6% respectively. These sub-regional averages however, mask substantial differences in the fertility rates and transitions of individual countries and at the sub-national levels (Finlay et al., 2018, 2016). Applying the 2015 revised model of proximate determinants by Bongaarts, the study by Finlay et al. (2016) found that in many countries from SSA the fertility rates of women from the richest wealth quantiles have continuously decreased while those of the poorest have lagged behind and in some cases remained the same.

There are different factors that have been identified as the underlying determinants of fertility transition in the SSA. Previous research found that declines in infant and child mortality, contraceptive use, delayed age at marriage, decrease in proportion married, frequency of sexual intercourse and years of schooling have driven fertility transition in sub-continent (Blanc and Rutstein, 1994; Bongaarts et al., 1984; Bongaarts and Casterline, 2013; Garenne, 2004; Handwerker, 1991; Hertrich, 2017; Mensch et al., 2006; Ortega, 2014; Shapiro and Gebreselassie, 2014). However, some studies have reported that the demand for and use of contraception in SSA has not necessarily been to limit fertility but rather as a replacement for traditional methods of managing birth intervals thereby challenging the contraceptive use-fertility decline hypothesis (Caldwell and Caldwell, 2002). In West Africa, fertility decline was observed to be associated with declining age differences between spouses, decline in polygyny, increased marital dissolution and the increased prevalence of female-headed families (Hertrich, 2017; Locoh, 2002). Meanwhile, Bulatao and Casterline (2001) observed from their review of existing studies the existence of various conclusions pertaining the factors driving fertility change across the region. These conclusions can partly be attributed to the different methods

and theoretical approaches that were adopted by various scholars to understand the factors driving fertility transition in SSA (Schoumaker, 2009).

Since the onset of fertility transition in SSA countries, many studies have established the importance of the proximate determinants in the decline of birth rates (Bongaarts and Potter, 1983; Bongaarts, 2017, 2015; Bongaarts et al., 1984). Some scholars have found evidence to extend the breadth of the important determinants of fertility to include intimate partner violence and female empowerment (Ngome and Odimegwu, 2014; Odimegwu et al., 2015). The relatively recent studies by Ngome and Odimegwu (2014) and Odimegwu et al. (2015) which found new insights into the fertility determinants and thus demonstrated that the search for the factors that affect fertility in SSA remains germane. This is supported by more recent research where it has been argued using empirical evidence that some of the proximate determinants have lost their original impact shortly after fertility transition started. For instance, the fertility inhibiting effects of postpartum practices in some communities from SSA have eroded thus partially contributing to the slowing of fertility transitions (Schoumaker, 2017). Unlike in earlier studies, the other factors such as delayed marriage have been found to have had a small effect on the decline of fertility in many SSA countries (Garenne, 2014; Shapiro and Gebreselassie, 2014).

The increased prevalence of the use of modern contraceptives has been widely claimed as one of the main drivers of the African fertility transition. However, some studies have found evidence to question this claim, arguing that the increase in modern contraceptive use alone may not lead to fertility decline unless the desired number of children decreases (Akin, 2005; Bankole, 1995; Behrman, 2015). The study by Casterline and El-Zeini (2017) which found

that the trends in unmet need for contraception and fertility were weakly associated in many areas in SSA corroborated to a considerable extent the previous findings by Akin (2005), Bankole (1995) and Behrman (2015). In reviewing fertility literature since the onset on fertility transition in SSA, one can therefore observe that multiple scholars have generated a wealth of different empirical findings about the factors driving fertility transition across the region and that the fertility elasticities vary across countries and over time (Bongaarts, 2017, 2015; Bulatao and Casterline, 2001; Schoumaker, 2009). These various views on the drivers of fertility change have never been starker as they have been with regards to the determinants of stalled of fertility transitions in SSA.

The stalling of fertility transition has been observed across the world including in Europe (Coale and Watkins, 1986; Van De Walle and Knodel, 1980). The occurrence of stalled fertility transitions of countries from SSA has however stood out because evidence has shown that these have occurred at high levels of TFRs (Bongaarts, 2006; Garenne, 2010; Howse, 2015; Shapiro, 2013). Different scholars have studied the stalling of fertility in SSA and identified an array of potential causes. According to Bongaarts (2008), the macro-level factors like the emergence of HIV/AIDS and its attendant increased rates of under-five mortality, very slow economic development and limited support of the family planning movement by many African governments have been the main drivers of the stagnation of fertility transitions. An earlier study by Bongaarts (2003) identified the lack of growth in educational attainment as a potential determinant of stalling and this was corroborated by Lutz et al. (2015). Meanwhile, Garenne (2010) found spatial variability regarding the causes of stalling across the six countries he identified to be experiencing stalled transitions.

The problem of achieving a global conclusion of stalling as signified in the diverse findings on which countries have experienced it and underlying factors is partially due to differences in the definitional approaches used by different scholars. For example, Shapiro (2013), Garenne (2010), Machiyama et al. (2010) and Bongaarts (2008) drew different lists of SSA countries which they argued to have experienced fertility stalling. Some studies have defined stalling as a lack of a significant decrease in the TFR of a country over a period covered by two successive DHS surveys (Bongaarts, 2008). In other studies, stalling was considered to constitute an increase in the TFR of a country over two or more successive surveys as was the case for Zimbabwe between the ZDHS2005/06 and ZDHS2010/11 and Zambia in 2000-2010 decade (Garenne, 2008b; Gries and Grundmann, 2015; Moultrie et al., 2008). According to Schoumaker (2009), these various definitional approaches to stalling, their attendant empirical analytical methods and data quality issues have partly contributed to the lack of a universal understanding of especially the determinants of stalling. It can be added that the great disparities in the socioeconomic and political situations of SSA countries contribute the complexity of establishing a universal account of the drivers of fertility change on the subcontinent. It is to be noted nonetheless that there is no empirical study whose findings, unless riddled with glaring technical flaws (which is rare and was never encountered in the reviewed literature), that are less relevant than the others when learning the historical development of the temporal behaviour of fertility rates in the highly diverse SSA region.

In the quest to minimise the negative impact of data quality issues Garenne (2011) suggested and tested techniques to determine the occurrence of stalling based on DHS data. The techniques are regression based; one linear regression to analyse the annual trend of fertility change while the other employs logistic regression (Garenne, 2011). The linear regression-based technique is applied to reconstructed single-year estimates of fertility rates. The benefit

of reconstructed single-year estimates over survey-specific point estimates is that they allow for misplacement of births to be easily identified, thus pointing to areas requiring smoothing techniques to be applied (Garenne, 2011). This approach was employed in the current study.

2.3.1 Men into the fold: Two-sex modelling of fertility in SSA

There has been a considerable number of studies based on SSA which have applied two-sex modelling frameworks to the investigation of the determinants of fertility levels (Bankole and Singh, 1998; Derose and Ezeh, 2005; Dodoo, 1998; Dodoo et al., 1997; Dodoo and Seal, 1994; Ezeh, 1991, 1992; Ogunjuyigbe et al., 2009). Other scholars investigating fertility determinants also demonstrated the importance incorporating male variables in understanding married couples' anticipated consequences of having a child which was crucial in predicting reproductive behaviour (Hofferth and Udry, 1976; Neal and Groat, 1977). When comparing two-sex to one-sex modelling approaches, Fried et al. (1980) found two-sex models were better equipped in determining the predictors of reproductive behaviour. However, the additional computational cost at the time meant that one-sex models were the preferred option (Fried et al., 1980). The improvements in tools for data analysis and programming software over the past decades have made it possible to apply two-sex modelling to the study of fertility without incurring substantial additional computational costs. Furthermore, the stubborn persistence of high fertility rates in patriarchal SSA calls for urgent application more inclusive and exhaustive approaches for investigating the factors responsible for holding back fertility transition.

The study by DeRose and Ezeh (2005) investigated male influence on fertility intentions during the first decade of Ghana's fertility transition. The study found that the rapid fertility decrease in fertility in Ghana between 1988 and 1998 was more associated with male education than

female's (Derose and Ezeh, 2005). The results from DeRose and Ezeh's (2005) corroborated those from an earlier investigation by Ezeh (1993) which found that men had exclusive influence on couples' family planning attitudes. The study by Ezeh (1993) was based on qualitative primary data and was designed to determine the validity of the 1988 Ghana Demographic and Health Survey (GDHS) which had showed that men were having greater impact on fertility than their female counterparts. The qualitative study confirmed the GDHS1988 findings which showed that gender inequalities manifested in power differentials between couples whereby husbands had greater influence than their wives (Ezeh, 1993). A comparable study of gendered contraceptive use preferences by Dodoo (1998) based the 1989 and 1993 Kenya Demographic and Health Surveys (KDHS) also found that men's choices eclipses their women counterparts'. Consequently, women's contraceptive use practices in Kenya were in line with their male partners' preferences instead of the women's (Dodoo, 1998). In fact, the KDHS1993 data showed that the use of contraceptives by women increased by three to four times if the husband wanted no more children unlike when it was the wife who wished to cease childbearing (Dodoo, 1998).

The prominent role of male influence on reproductive behaviour in Ghana was also confirmed by Dodoo et al. (1997) whose research was based on an independently collected survey from Accra. Just like Ezeh's (1993) earlier study, Dodoo et al. (1997) found that need for birth spacing and stopping by men had better predictive power on contraceptive compared to women's. This finding highlights gender inequalities in fertility determination, a conclusion also drawn from the GDHS1988 by Dodoo and Seal (1994) who investigated spousal differences in fertility goals. Applying a gender inequality perspective, Dodoo and Seal (1994) found that women who gave non-numeric responses to questions on fertility goals were mostly from the low socioeconomic status bracket and had significantly less power compared to their

husbands. The term non-numeric response is used where a female respondent declines to give the actual number of children she would like to have by the end of her reproductive career, stating instead that she can have as many as God allows her or her husband desires. In such instances, husbands' characteristics become crucial determinants of fertility (Ezeh, 1991, 1992). According to Ezeh (1991), consensus on reproductive goals between couples significantly increased the use of contraceptives in Ghana. Although the use of contraceptives may not always translate to adjustments in fertility preferences, it highlights the crucial role of male approval of women's reproductive aspirations which can be harnessed to facilitate fertility decline. When a husband disapproved of contraceptive use, women were significantly less likely to use modern methods of contraception even if they wanted to (Ezeh, 1991). In the 1992 study, Ezeh examined partner's attitude towards family planning on contraceptive use and fertility preferences controlling for education. The study found positive correlations between increased educational attainment of husbands and their approval of family planning which in turn increased the likelihood of wives approving of the use of family planning (Ezeh, 1992). The fertility preferences of wives however, did not influence their husbands' (Ezeh, 1992).

The existing studies of fertility which applied two-sex modelling approaches generated valuable insights on the landscape of fertility within and across countries from SSA. The comparative investigation of the contraceptive use practices between Ghana and Kenya by Dodoo (1995) revealed that the intercountry differentials that existed were due to the variability in the fertility goals of men. In the same study, Dodoo (1995) demonstrated the utility of two-sex modelling with regression-based decomposition in the understanding of the intercountry differentials in the fertility regimes of the SSA region. The study by Ngom (1997) also applied two-sex modelling to 1988 and 1993 DHS data from Ghana and Kenya and found that fertility trends in the two countries were associated with unmet need for contraception for both men

and women. In Zimbabwe, the results from Mbizvo and Adamchak's (1991a) study revealed that contraceptive use decisions and the number of children were mainly determined by men. Using data from the Male Fertility Survey of 1988, Mbizvo and Adamchak (1991) observed that while men in Zimbabwe believed it was their responsibility to decide whether to use contraceptives, the majority stated that the burden to seek information about contraceptives and accessing them was the responsibility of women. Although the study by Mbizvo and Adamchak's (1991) did not apply two-sex modelling, the understanding of Zimbabwean men's attitudes towards family planning and fertility goals has important implications in the understanding of the fertility regimes of the country's patriarchal social context.

2.3.2 The role of HIV/AIDS in fertility transition

The emergence of major population-level health-related issues have historically shaped the demographic transitions of the countries across the world. One of these major health problems was HIV/AIDS which had a major impact on the populations of SSA where the Southern Africa sub-region was the most affected. The emergence of HIV/AIDS had a global effect on societies with many reducing their fertility rates through the use of barrier methods (condom) of birth prevention as well as adoption of induced abortion to reduce the risk of death among the HIV-infected women (De Vincenzi et al., 1997; D'ubaldo et al., 1998; Kalemli-Ozcan, 2012; Lewis et al., 2004; Ntozi, 2002, 1997; Setel, 1995; Thackway et al., 1997). In Australia, Thackway et al. (1997) found that knowing one's HIV-1 positive status associated with significant decrease in the incidence of pregnancy compared to when women knew that they were not infected. The same study also found that fertility rates were much lower among HIV-positive women and more than 65% of those who displayed AIDS symptoms terminated their pregnancies which was more than double the rate for those with no HIV/AIDS symptoms (Thackway et al., 1997). The study by D'ubaldo et al. (1998) which was based in Italy found increased odds of

miscarriage among HIV-infected women compared to those who were not infected. Meanwhile, the France-based study by De Vincenzi et al. (1997) reported significant decreases in the incidence of pregnancy following diagnosis of HIV among women.

The demographic impact of HIV/AIDS was highest in SSA where at one point the prevalence of 15-49-year old people living with HIV exceeded 25% in some countries like South Africa, Swaziland, Zimbabwe and Botswana (Lewis et al., 2004). The effect on fertility transition was investigated through understanding how the people exploited the proximate determinants primarily due to fear of infection and death (Glynn et al., 2000; Gregson et al., 1997; Ntozi, 1997; Ryder et al., 1991; Zaba and Gregson, 1998). According to Ryder et al. (1991), the use of modern contraceptives was higher among HIV-positive women compared to those who were negative. This was also observed in Cameroon by Glynn et al. (2000) who reported that women increased their use of modern contraceptives after diagnosis of HIV. The study by Gregson et al. (1997) observed that young women in the Zimbabwean districts of Mutasa and Chimanimani postponed entering into unions as a way of reducing risk of HIV infection. The delay in the formation of the first union has a population-level impact with respect to the reduction of fertility rates. In a related observation, Ntozi (1997) examined remarriage dynamics in Kenya and Uganda and found that remarriage rates of women widowed in the 25-35-year age group had decreased significantly following the emergence of HIV/AIDS.

The findings from the studies highlighted in the preceding paragraph were not isolated. Other scholars found related results from other parts of SSA (Asiimwe-Okiror et al., 1997; Desgrees et al., 1998; Kamali et al., 2000; Magadi and Agwanda, 2010; Mukiza-Gapere and Ntozi, 1995; Okeibunor, 1999; Rutenberg et al., 2003). From the focus group discussions conducted by

Mukiza-Gapere and Ntozi (1995), women reported that they delayed marriage because they feared HIV infection. The research conducted by Asiimwe-Okiror et al. (1997) focusing on Ugandan youth aged 15-19 years reported that HIV/AIDS resulted in the significant delay of sexual debut among these youth. These findings were corroborated by Kamali et al. (2000) who studied youth from other districts of Uganda which were not sampled in the Asiimwe-Okiror et al. (1997) study. In Zambia, Rutenberg et al. (2003) conducted 23 in-depth studies in Ndola where respondents favoured reduction in family sizes for HIV-positive women as a method for reducing the risk of infecting spouses and children. There were similar findings from samples recruited from peri-urban and rural communities of Zambia by Baylies (2000). Okeibunor (1999) reported increased condom use in Nigeria due to fear of HIV-infection while Desgrees du Lou et al. (1998) observed significant decreases in the incidence of pregnancy among HIV-positive women.

The studies reviewed above all point to the fertility depressing effect of HIV/AIDS in SSA and globally. There were however instances of mixed results such as those reported in Magadi and Agwanda (2010) who found that the 2003 Kenya DHS appeared to show that the regions worst affected by HIV/AIDS experienced the clearest reversal of fertility transition. This was because in these regions, the reduction in breastfeeding coupled with increased desire for children due to high infant mortality pushed fertility rates up (Magadi and Agwanda, 2010). However, a closer analysis of the regions experiencing more defined cased of stalled transitions showed that HIV-positive women had about 40% less odds of having a recent child (Magadi and Agwanda, 2010). It is conceivable that those who were HIV-negative may have adopted an insurance approach in case they may get infected in the future which would render them unable to continue reproducing.

The role of HIV/AIDS on the fertility transitions of SSA countries is relevant for the mere quest for understanding why the trends of fertility rates on the subcontinent have followed the trajectories that have been experienced. It is to be acknowledged that HIV/AIDS in itself has little fertility-control policy significance because it cannot be used as reference point for policy interventions aimed at unlocking the barriers to fertility declines in many SSA countries. The emergence of HIV/AIDS did not really lead to a global change in pronatal cultural attitudes given that the growth in the coverage of antiretroviral treatment (ART) especially towards the turn of the 21st century coincided with the occurrence of stalling in many countries. However, an understanding of the impact of the negative reinforcement of HIV/AIDS on reproductive behaviour can provide a reference point for designing equally effective positive reinforcements of fertility-inhibiting reproductive behaviours. The concept of behaviour reinforcement forms the central tenet of operant conditioning theory of behaviour psychology where progressive individual behaviours receive positive rewards (Skinner and Ferster, 2015). Just as negative rewards like death from HIV/AIDS changed the reproductive behaviours of populations, it is conceivable that positive rewards like demonstrable socioeconomic and health outcomes can also inspire the adoption of desirable fertility-inhibiting reproductive behaviours.

2.4. Review of gaps in the literature

The problem statement presented in Chapter 1 under section 1.2 provided a critic of the problems of the state fertility knowledge. This section bears a close relationship with the problem statement. In reviewing the research that employed a gendered approach to the study of fertility and determinants, one can observe that there are common characteristics of the studies that highlight some important gaps in the literature. One of the characteristics is that,

with the exception of Bankole and Singh (1998), most studies have been mainly focused on two sub-regions of SSA, the East (Kenya) and West Africa (Ghana and Nigeria). This is understandable given that West Africa was observed to be more resistant to fertility transition compared to other sub-regions due to cultural factors among others (Smith, 2004). Nonetheless, similar interest in application of two-sex modelling to the study of fertility in Southern Africa is also warranted because the well-defined fertility transitions of the countries from this sub-region provides a platform to quantify the contributions of male variables to fertility change. Quantification of the role of men in the fertility transition in Southern Africa which is the leading sub-region in fertility transition in SSA is therefore vital in providing evidence for ascertaining men's role in fertility change. This evidence can be vital in the formulation of relevant policies for the lagging sub-regions.

Another characteristic of the reviewed studies is that the overriding interest in the existing literature appears to be the understanding usage practices of modern contraceptives and not the actual level of fertility. Given the time period studied, this is justifiable because contraceptive use had been proved to be a major determinant of fertility in SSA (Bongaarts et al., 1984). However, the predominant focus on contraception may not provide sufficient evidence to decompose the relative roles of men and women in recent fertility changes given that there has been evidence showing that contraceptives have played a limited role in the progress of fertility transition (Behrman, 2015; Caldwell and Caldwell, 2002; Casterline and El-Zeini, 2017; Schoumaker and Tabutin, 2008). A clear example of the reduced fertility inhibiting effects of contraceptives were the findings from Zimbabwe by Udjo (1996) who showed that the levels of modern contraceptives use especially among prime childbearing ages were not associated with fertility rates. a comprehensive study estimating the adjusted contributions of proximate

vis-à-vis background determinants is needed to obtain a full appraisal of the drivers of fertility changed in SSA countries.

In the study by Mberu and Reed (2014), background factors such as religion, attitudes towards family planning and poverty were observed to be responsible for continued high fertility among Hausa/Fulani/Kanuri women in Nigeria. The study thus suggested that fertility control interventions should target women in such sociocultural and economic contexts. However, the study did not recognise the extent to which men in these sociocultural contexts impacted on the women's reproductive behaviours. Consequently, it cannot be determined from Mberu and Reed's (2014) study what role men play in women's exposure to the sociocultural and economic determinants and the continued high fertility levels. This deficiency in Mberu and Reed's (2014) study also exists in other previous studies like Lesthaeghe (2014), Madhavan and Francois (2013) and Bongaarts and Casterline (2013) which have problematised high fertility as a women's issue as mirrored in the focus on understanding how women's characteristics explain recent fertility rates.

A striking feature of this literature review chapter for a study aimed at understanding marital fertility transition in SSA is the lack of attention on total marital fertility rates. To the best knowledge of the author, a search for such studies from the scientific databases did not return any demographic studies on marital fertility transitions in SSA. This is therefore one of the important gaps in the literature that needs to be addressed because if marital fertility rates remain in the peripheral focus of mainstream research, it is likely that resultant policies are less equipped to address the persistently high marital birth rates. Although average ages at first marriage have generally increased over the past five decades, the majority of women from SSA

get married before reaching 40 years and spend little time outside marital unions once married (Clark, 2015). Furthermore, in some of the countries from West Africa like Burkina Faso, Guinea, Mali, and Niger which have some of the highest fertility rates in SSA, more than 50% of the girls born in recent decades get married before their 18th birthday with Niger having 77% (Koski et al., 2017). An understanding of the determinants of fertility within the marriage institution therefore has the potential to inspire policy directions that will impact positively the fertility transitions of these countries.

2.5. Country contexts

2.5.1 Ghana

The Republic of Ghana is located along the south-facing coast of West Africa where it covers 238,537 square kilometers of land area. It shares borders with the French-speaking countries Togo in the east, Burkina Faso in the north and northwest, and Cote d'Ivoire in the west with the southern part being the coastline to the Gulf of Guinea and Atlantic Ocean. The country was the first from SSA to attain independence on 6 March 1957. The 1960 census identified 17 major population groups based on language with the largest group accounting for 44% in a population of 6.7 million people. Currently, estimated population size of Ghana is 30.4 million with the Akans (48%) constituting most of the population followed by Mole-Dagbani (17%), Ewe (14%) and Ga-Dangme (7%) (United Nations, Department of Economic and Social Affairs, Population Division, 2019). The growth rate of the national population since the 1970 census (which recorded 8,6 million people) has averaged over 2.5% and this has resulted in Ghana's population more than tripling in less than 50 years between 1970 and 2019. The sex ration of Ghana, which was 102 males per 100 females in 1960, has steadily decreased over the years and was recorded from the 2010 census at 95 males per 100 females.

Ghana was the first country from SSA to adopt an official population policy. The government of Ghana formulated National Population Policy (NPC) in 1969 in recognition of the need to control the high fertility rates and population growth in the country. This 1969 policy, however, did not achieve most of its aims. Consequently, it was revised in 1994 to also consider issues of HIV/AIDS, the natural environment, the elderly and children. The 1994 Ghana Population Policy entailed a deliberate integration of population variables in the national development plans and programmes of the government. Through the 1994 NPC, Ghana sort to achieve by 2020 a reduction of the national total fertility to 3.0, increase contraceptive prevalence rate (CPR) to 50%, reduction of population growth rate to 1.5% and increase of life expectancy to 70 years from 5.2 births per woman, 2.6% per annum and 57 years respectively.

Ghana's economy structure has seen small shifts in the last two decades with the service and industry sectors overtaking the agriculture sector as the largest contributors to total production output in the country. These shifts followed the recovery from the declines in the economy which were experienced throughout the 1970s and 1980s. As of 2014, the service sector was contributing 52% of the Ghana's gross domestic product (GDP) followed by industry (27%) with agriculture contributing 22%. Despite the growth in the share of the GDP contributed by service and industry sectors, agriculture continue to provide employment to many Ghanaians. The Ghana Statistical Office (2014) reported that 45% of the economically active population are engaged in agriculture. In the year 2007, the government of Ghana introduced the social protection programme Livelihood Empowerment Against Poverty (LEAP)

2.5.2 Kenya

Kenya obtained independence from British rule in 1963 and followed a multiparty political system for 17 years; the country was converted to a single-party state in 1981. The one-party state system was in existence until 1992 when the National Alliance of Rainbow Coalition (NARC) replaced the Kenya African National Union (KANU) through a national election. Geographically, Kenya is in East Africa where it shares borders with Ethiopia in the north, Somalia in the northeast, South Sudan in the northwest, Tanzania in the south and Uganda in the west. The eastern side of Kenya is the coastline to the Indian Ocean where the port of Mombasa provides the country and its neighbours a gateway to global trade. The last national census for Kenya held in 2009 enumerated 38.6 million people. The preceding census conducted in 1999 enumerated 28.7 million implying that Kenya's population grew by one million people annually between the last two censuses. The 2019 mid-year population estimates for Kenya show that the country is now home to 53 million people (United Nations, Department of Economic and Social Affairs, Population Division, 2019).

The first explicit population policy for Kenya was adopted in 1967, integrating family planning into the maternal and child health programmes of the country's ministry of Health **(KDHS1998)**[2]. The first official population policy for the country was however came in 1984 and updated in 1996, 2007 and 2012 (Garenne, 2018). The family planning programme of 1967 was the first of its kind in SSA and was launched just four years following of independence which was attained when Kenya had the highest TFRs in the world (Garenne, 2018). Over the years, the policy was transformed to incorporate wider socioeconomic and environmental

[2] National Council for Population and Development (NCPD), Central Bureau of Statistics (CBS) (Office of the Vice President and Ministry of Planning and National Development) [Kenya], and Macro International Inc. (MI). 1999. *Kenya Demographic and Health Survey 1998.* Calverton, Maryland: NDPD, CBS, and MI

factors affecting the population as well as in line with global frameworks. For instance, the Government of Kenya updated its Sessional Paper No. 4 of 1984 on Population Policy Guidelines to incorporate the population-related issues that were raised in the 1994 Cairo International Conference on Population and Development. In the year 2012, the Government of Kenya launched a new population policy designed to curb high rates of population growth, setting the objective of achieving a total fertility rate of 3 births per woman by 2030 down from 5 in 2009 (Worley, 2014).

Kenya has the largest economy in East Africa. Its geographical location positions the country as a strategic commercial and logistical hub for East and Central Africa regions (Embassy of the Republic of Kenya in Japan, 2020). Agricultural accounts for most of the total exports from Kenya; as of 2013, 65% of the country's exports were agricultural produce and provides 18% of formal employment in the country (Embassy of the Republic of Kenya in Japan, 2020). Kenya currently boasts one of the fastest growing economies in SSA with an annual GDP growth rate 5.7% for 2019 (World Bank, 2019). From 2002 to 2018, Kenya's GDP grew from 12.7 billion to 87.9 billion US dollars. The contribution of agriculture to the national GDP has been increasing over the last decade. Agriculture accounted for 20.5% of the GDP in 2007, growing to 34.6% of the national GDP in 2017 (Plecher, 2019). Meanwhile over the same period, the services and industry sectors' share of the national GDP decreased from 50.2 to 43.6% and 19.3 to 165% respectively (Plecher, 2019).

2.5.3 Rwanda

Rwanda is a landlocked country situated just south of the equator in Central Africa, bordering Uganda in the north, Burundi in the south, Tanzania in the east and Democratic Republic of

Congo in the west. The country covers a surface area of 26,338 square kilometers, comprising five geographically based provinces namely the North, South, East and West of the City of Kigali. Rwanda obtained republic status and independence from Belgium in 1962 but the ensuing post-colonial period involved ethnic violence culminating in the 1994 genocide. During the genocide, the health and education infrastructures were destroyed as well as the formal job market. This was followed by the formation of a transitional administration signaling the start of a new Rwanda as exists today. The current estimated population size of Rwanda is 12,3 million people of whom 52% are female. The country's population is largely rural with more than 80% of the people found in rural areas. Among the urban population, almost half (49%) live in the capital city of Kigali. The population of Rwanda is very young, with 43% of the total being 15 years and below. At the last census conducted in 2012, Rwanda had 10,5 million population size having increased from 8,1 million as enumerated in the 2002 national census. The previous censuses of 1978 and 1991 showed that the population of Rwanda was 4,8 and 7,1 million respectively which means that between 1978 and 2012 the country's population size more than doubled.

Rwanda had its first family planning initiative in 1982 which provided for the promotion of family planning trained personnel known as *Abakangurambga* (Awakeners of the People) (Kamanzi et al., 1990). The early 1980s saw the Rwandan government use mass communication platforms including radio, print media, theatre and cinema to raise awareness of the demographic challenge in the country and encourage the use of family planning (Kamanzi et al., 1990). From 1987, there was focus on reaching the rural population with family planning information (Kamanzi et al., 1990). A dedicated population policy was adopted in 1990 with the aim of reducing fertility and population growth through promoting interpersonal communication using family platform (Kamanzi et al., 1990). To create a

conducive environment for the family planning policy, the government of Rwanda committed to improve public health system, promote education and increase school attendance, advancement of women and increasing production in the economy. The civil war of the early 1990s which culminated in the 1994 genocide saw the achievements of the 1980-1990 in the family planning front completely reversed. Following the genocide, there was a shift in the government's view of populations towards emphasis on better of quality of life and strengthened resolve on population growth. Consequently, a new population policy was designed and adopted in 2003 and this clearly articulated strategies and objectives aimed to affect fertility, mortality and socioeconomic factors. This new population policy highlighted the need to achieve slow population growth, access to primary and secondary education, equal involvement in development for both men and women and sustainable management of natural resources.

The economy of Rwanda has been characterized by high annual growth rates averaging 8% per year over the 2001-2015 period. Between 2007 and 2014, the growth rate of food crop production was double the rate of population growth. The period after the turn of the new millennium has been characterized with the growth of the service sector. In 2014, the service sector accounted 48% of the country's GDP followed by the agriculture sector which contributed 33%. Despite the service sector accounting the most contribution to the GDP, the agricultural sector remains a major component of the country's economy and still provides employment to most Rwandans, accounting for 75% of the total employment in the country. This is because the Rwandan agricultural sector has traditionally comprised mainly small holder farmers, but it is worth noting that the government has sought to improve this sector through agrarian reforms. In the recent years, protection of soil from erosion, regionalization of crops and land consolidation have been implemented to improve the agriculture sector. This

has positively impacted on poverty levels in the country with the percentage of households living below the poverty line declining from 45% in 2011 to 39% in 2014. There is high labour-force rate in Rwanda with about 85% of the those aged 15 years and above considered in the labour-force.

2.5.4 Zimbabwe

Zimbabwe is a landlocked country that lies north of the Tropic of Cancer covering 391 thousand square kilometres stretching from Limpopo and Zambezi rivers. The country shares borders with Botswana in the west, People's Republic of Mozambique in the east, Republic of Zambia in the north and northwest, and South Africa in the south. The current estimated population size for Zimbabwe stands 15 million, growing at an annual rate of 2.0%. Between 1982 and 1992, the population of Zimbabwe grew from 7.6 to 10.4 million, reaching 11.6 million in 2002. Most of the Zimbabwean population is of African descent with the Shona and Ndebele being the dominant languages. In total, there are 15 ethnic groups in Zimbabwe, and these are Shona, Ndebele, Kalanga, English, Xhosa, South Sotho, Tswana, Venda, Chewa, Tsonga, Tonga, Nambya, Ndau, Koisan and Chibarwe.

Zimbabwe has had family planning services available since 1953, starting as a voluntary movement and therefore lacked a well-coordinated effort led by the state (Zinanga and Mundial, 1992). The activities of family planning were placed under the Rhodesia Family Planning Association (RFPA) in 1965 which at the beginning targeted the white population only. The family planning services were availed to the indigenous African population in the year 1966 when the Ministry of Health approved the provision of these services in public hospitals. The RFPA was perceived negatively during the war of liberation in the 1970s which

culminated in the 1980 independence. Following independence, the RFPA was placed under the Ministry of Health in 1981 by the new Government of Zimbabwe and was officially designated parastatal status in 1985 named Zimbabwe National Family Planning Council (ZNFPC) (Manjanja, 1993). The ZNFPC championed fertility control in the country through a network of clinics and community-based distribution system as well as non-ZNFPC hospitals and clinics. Besides the mainstream health institutions, the ZNFPC also worked with the Ministry of Education and Culture through the Youth Advisory Services to provide Family Life Education to the young people and their parents. The availability of contraceptives such as the pill, condoms, chemical barrier methods, IUDs and injectables was increased in through the 1980s and 1990s such that knowledge of modern contraceptives was already near universal by 1999 (Schwartz et al., 1999). The ZNFPC clinics were mostly concentrated in urban areas with the association preferring to use community health workers in the rural areas. According to Zinanga and Mundial (1992), there were serious family planning efforts in the 1980s in Zimbabwe but these stagnated towards the end of the 1990s.

The socioeconomic context of the country is currently characterized by high unemployment and overrepresentation of the economically active age group in the informal sector. In the two decades following independence, the economy of Zimbabwe was diversified, characterized by relatively developed agricultural, industrial, commercial and mining sectors. The manufacturing and agriculture sectors have continued to be the dominant producers of products for export and domestic markets. The generally positive developments of the 1980-1995 post-colonial period in Zimbabwe were followed by adverse trends emanating from the transformations in the political landscape of the country. The 1997 large cash payouts to the war veterans of the liberation struggle and the military support to the Democratic Republic of Congo (DRC), and the 1999 Fast Track Land Reform Programme (FTLRP) had an adverse

impact on the economy of Zimbabwe and the livelihoods of most of the people. The events of the 1997-1999, besides negatively affecting the economy of the country, had an adverse impact on the supply of contraceptives especially in the late 2000s as the health system collapsed amid a hyperinflationary environment. The general decay in the macro environment which affected the health infrastructure in the 2000s and the 2010s coincided with ruling Zimbabwe African National Union Patriotic Front's (ZANU PF) growing apathy towards fertility control. At the same time the formal job market deteriorated, unemployment levels increased and the majority of the population were found in informal jobs.

2.6. Theoretical frameworks

This section discusses the theories of fertility transition guiding this study. In discussing the frameworks providing the theoretical underpinning for the study, the section also reviews past applications of the theories in past studies of fertility globally and in SSA. It also presents the conceptual framework which is an adaptation of the theories and reviewed literature.

The high fertility regimes of countries from SSA for most of the 20th century, with many countries still maintaining high fertility rates in the current century, resistant to the fertility inhibiting forces of the emergence of urbanisation initially presented scholars with the task of investigating the factors supporting high fertility rates in the subcontinent. The theories developed by Boserup (1985) and Caldwell (1978) which focused on the agrarian economic modes of production and cultural values on reproduction as well as the interlinkages between culture and subsistence in SSA provided the theoretical understanding of fertility in the subcontinent. The onset of fertility transition led by countries from Southern Africa followed by those from East Africa created the opportunity for researchers to study this component of

demographic transition as it occurs. The research on the fertility transitions of the countries from SSA found theoretical underpinning from the models that had been applied to the study of temporal fertility changes outside Africa. Following on Ezeh et al. (2009), the literature on fertility change can be classified in terms of the three main theoretical frameworks that undergirded past empirical investigations and these are the reproductive behaviour model, institutional model and the socio-economic model. The reproductive behaviour model focuses on the proximate determinants to investigate fertility decline while the institutional model focuses mainly on the contributions of the family planning movement (Ezeh et al., 2009). The socio-economic model encompasses economic and cultural perspectives developed by Becker and Caldwell (1978) respectively with the aim of theorising persisting high fertility levels (Ezeh et al., 2009). The theoretical underpinning for this study was drawn from two of the three models and these were the reproductive behaviour and socioeconomic models. These two models are discussed in turn below, including their empirical applications in the existing literature. The institutional model was excluded from the theories informing the conceptual framework for this study because its main variables – the presence of family planning policies and amount of investment in fertility control programmes could not be directly measured from the DHS data. The relevance of this theory to the understanding of fertility and some of the findings from the current study is however, maintained. A description of the main tenets of the institutional model is therefore provided.

2.6.1 Reproductive behaviour model

This model focuses on measuring the impact of changes in reproductive behaviours on fertility outcomes (Ezeh et al., 2009). The changes in reproductive behaviours are perceived to reflect transformations in the fertility preferences of people usually from large to small family sizes (Ezeh et al., 2009). The widely applied reproductive behaviour model is the proximate

determinants model following Bongaarts' (1978) operationalisation of the formulations first propounded by Davis and Blake (1956). The model of proximate determinants identifies two classes of factors, direct and indirect factors. The indirect factors which are also called background or distal determinants, operate through the direct (proximate) factors to affect fertility outcomes. The proximate determinants of interest to the current study are contraceptive use, abortion, postpartum infecundity and age at first union.

2.6.1.1 Empirical applications of the reproductive behaviour model

Following the demonstration of the significance of proximate determinants on fertility levels and differentials in SSA by Bongaarts (1978) and Bongaarts et al. (1984), many scholars have analysed reproductive behaviours to understand the fertility levels SSA countries (Basinga et al., 2012; Blanc and Rutstein, 1994; Bongaarts, 2008, 2006; Finlay et al., 2018; Garenne, 2010; Palamuleni, 2017; Shapiro and Gebreselassie, 2009; Thomas and Muvandi, 1994; Wamukoya et al., 2016). These studies sought to explain fertility changes by examining the impact of proximate determinants or changes in the factors that alter the form of proximate factors. For example, the studies by Bongaarts (2008, 2006), Garenne (2010), and Shapiro and Gebreselassie (2008) analysed reproductive behaviours to link the changes in the age at first union, contraceptive use and increased non-marital exposure to intercourse to fertility transition arguing that these factors potentially contributed to stalling in many countries from SSA.

There are recent studies that have applied the reproductive behaviour model to understand drivers of fertility decline in some SSA settings (Palamuleni, 2017; Wamukoya et al., 2016). The setting of the study by Wamukoya et al. (2016) Nairobi in Kenya while Palamuleni (2017) analysed the DHS data for Namibia and the results from both studies suggested that

contraceptive use and non-marriage had fertility depressing effects. Meanwhile, Finlay et al. (2018) investigated the impact of reproductive behaviour differences across 21 SSA countries and found that the proximate determinants significantly explained variabilities in the fertility rates among the countries. Notwithstanding the individual limitations of the existing literatures as highlighted in Chapter 1 section 1.2 and given that the current study sought to contribute to the understanding of the determinants of marital fertility changes in SSA, it as an educated consideration to also find theoretical underpinning from the reproductive behaviour model as previous studies did. Furthermore, some of the independent variables that were analysed in this study such as contraceptive use, postpartum infecundity and abortion are central to the model of proximate determinants thus making the theory a good fit for the current endeavour.

2.6.2 Socio-economic model

The socio-economic model, widely known as demographic transition theory (DTT), has been the most used macro theoretical approach to the study of fertility transition. The DTT provides the main theoretical socio-economic model for understanding fertility. The DTT views fertility transition as a component of wider demographic change that is due to economic development and modernisation (Hirschman, 1994). This theory postulates that economic development leads to medical advances including new reproductive control technology, reduction in infant and child mortality and rise in urbanisation (Hirschman, 1994). These developments are a feature of the industrial economy which is incompatible with large families thus fertility levels decline (Mason, 1997). Based on this theory, it therefore expected that as countries develop and greater proportions of their populations become urbanised, fertility rates are bound to decrease.

The theory of Ideational change, which is used to explain the DTT, views fertility transition in terms of changing cultural values that have a sanctioning effect on individual behaviour with respect to fertility-related aspects such as desired family size, women education and religious beliefs (Caldwell, 1978; Cleland and Wilson, 1987). The theory is attributed to the works of Caldwell (1978) who distinguished modernisation from Westernisation whereby the former refers to structural changes in the mode of economic organisation while the latter concerns cultural transmission involving new ideas, norms and values about birth control spread across societies (Kirk, 1996; Lesthaeghe and Surkyn, 1988). According to Kirk (1996), Westernisation can occur independently from modernisation thus its effect on fertility transition can occur in the absence of economic development.

2.6.2.1 Empirical applications of the socioeconomic model

The socioeconomic model has been a dominant theoretical formulation of the relationship between temporal changes in fertility rates and the properties of development including socio-cultural evolution globally and in SSA. The existing studies that applied this theoretical approach found that the high fertility regimes of most countries from SA were economically and socio-culturally rational (Caldwell, 1982; Caldwell and Caldwell, 1987; Stecklov, 1999). As evident in the past studies that applied the socioeconomic model, most of the variables of focus fall in the category of the so-called indirect or background determinants and these are education, employment, rural-urban residence, religious belief systems and household wealth. The influence of these variables on fertility has been studied in relation to their temporal compositional changes (Bongaarts, 2008, 2006, 2002; Ezeh and Dodoo, 2001; Garenne, 2008a; Schoumaker and Hayford, 2004; Shapiro and Gebreselassie, 2009). These studies have argued that population-level distributional changes have contributed to the fertility transitions on countries from SSA although they did not quantify the magnitudes of the contributions. Other

studies have applied the socioeconomic models to explain the differentials in fertility rates at one point in time (Kravdal, 2012, 2002; Lesthaeghe et al., 1989; Martin, 1995; Masudi-Uchudi, 2001; Shapiro, 2012; Shapiro and Tenike, 2015). In relation to the DTT in particular, the study by LeGrand et al. (2003) empirically investigated the effect of declining child and infant mortality on fertility levels in Senegal and Zimbabwe.

2.6.3 Institutional model

The institutional model understands fertility transition in terms of the level of infrastructural support from public institutions, non-governmental organisations and international agencies particularly with respect to family planning and reproductive health (McNicoll, 1980). The institutions found in a country or society contribute to shaping the decision making environment of individuals (McNicoll, 1980). Following on the perspective of the Institutional mode, the adoption of a population policy that clearly highlights a deliberate intention to limit population growth accompanied by strong government commitment to family planning is expected to be followed by a period of fertility decline. In the countries where governments show strong commitment to their fertility control aims, there is better knowledge and positive attitudes towards use of family planning services for purposes of limiting fertility (Mberu and Reed, 2014). The Institutional model also looks at the life opportunities provided by economic environment to which people are exposed, for example, employment and educational opportunities (Aassve et al., 2014). According to this theory, it is therefore expected that greater access to education and formal employment opportunities especially for women is negatively associated with fertility and therefore supports the decline of fertility over time.

2.6. Conceptual Framework

The conceptual framework for this study was adapted from the reproductive behaviour and socioeconomic models described above. The conceptual framework, as presented in Figure 2.1 below, shows the relationships connecting the independent variables and direction of influence of the independent variables on marital fertility. The empirical application of the conceptual

framework recognised two levels of independent variables which were background and proximate determinants and the outcome variable which was age-specific marital fertility rate. The background variables were further classified by sex – male and female, and level of aggregation – individual, household and community. The arrows connecting the classes of the variables represent the ways in which the predictor variables are associated with and affect marital fertility rates.

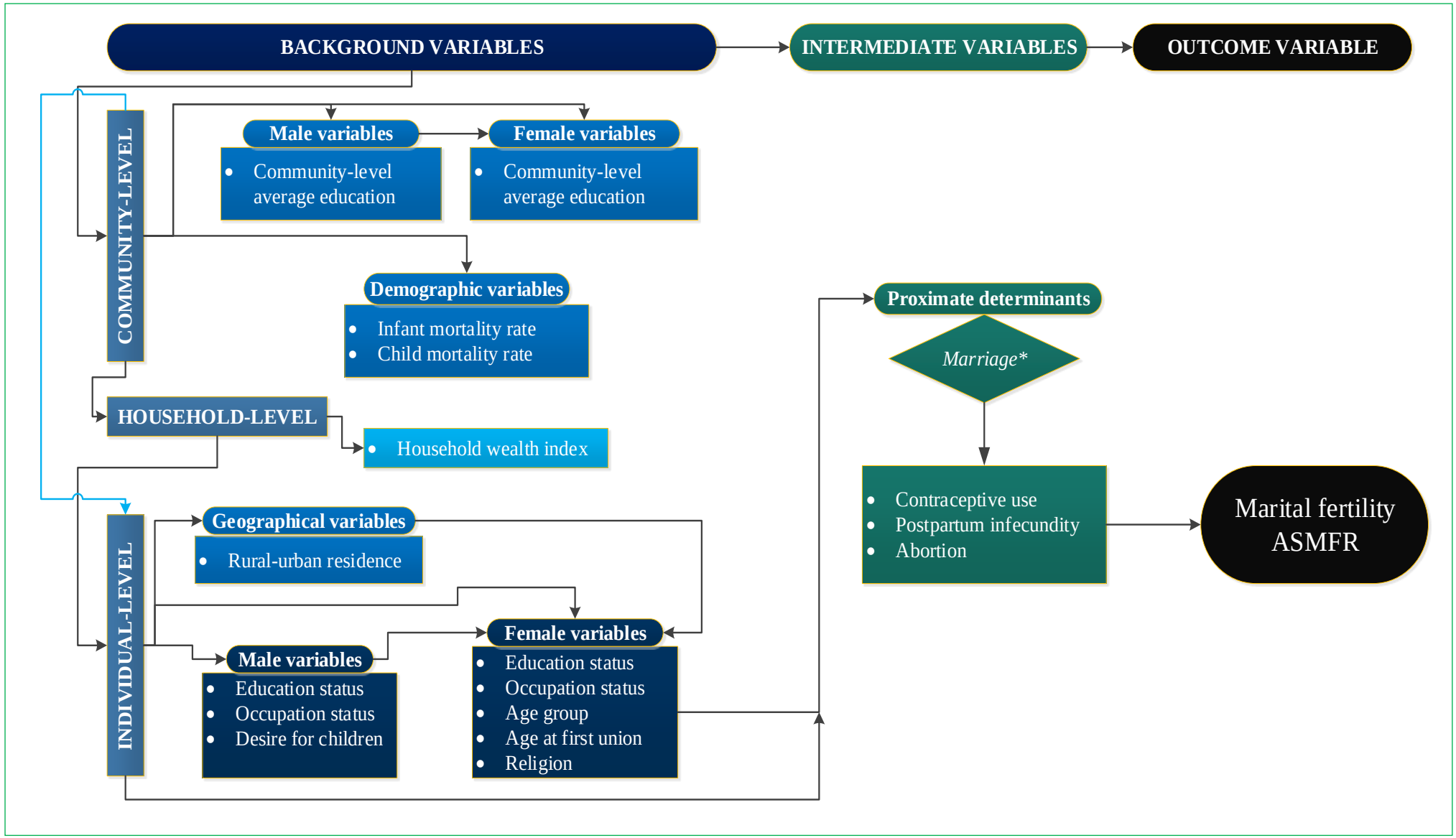


Figure 2.1: Conceptual framework for the study [Adapted from the reproductive behaviour and socioeconomic models].

2.8 Summary of the chapter

This chapter reviewed the literature on the fertility rates and transitions globally and regionally. Globally, the chapter focused mainly at the pioneering region of western Europe and its offshoots like North America and Australia because of their relevance and links to the SSA region through colonialism and the adoption of European languages and cultures through globalisation post-colonialism. The different studies which investigated the fertility transitions of European populations looked at nuptiality patterns, cultural and linguistic patterning, and the role of industrialisation. The fertility transitions of these populations were mainly Malthusian because they were underlain mainly by non-marriage, abstinence and delayed union formation. Looking at the SSA, many studies have argued for the central role of proximate determinants while others investigated the so-called background or indirect factors. based on the reviewed literatures, there has been a sub-regional patterning of fertility transition with countries from Southern Africa being the pioneers followed by East Africa while Central and West Africa have had delayed onset of transitions. The study of the determinants of fertility rates and temporal changes has involved a variety of methodological approaches. Some scholars employed ordinary regression models while used multilevel modelling to delineate spatial influences. There have also been studies that used decomposition methods as well as those that employed two-sex modelling as opposed to investigating the effects of female variables only. In concluding this chapter, it is worth pointing out that fertility is arguably the most studied demographic event, and this makes it nigh impossible to review every piece of research conducted on the topic. Nonetheless, this chapter made an attempt to review the pertinent literatures and views pertaining fertility transition. This was accomplished by reviewing studies on drivers of fertility change and modelling approaches to analysing the

determinants of fertility as well as major transformations like the rise of HIV/AIDS especially in the 1990s. The review of the gaps in the existing studies showed the relevance of the current study and nests it within a larger body of literature on fertility changes.

CHAPTER 3 : METHODOLOGY

3.1. Introduction

This chapter presents a detailed discussion of the methodology employed to address the research questions and achieve the goal of the study. Chronologically, the chapter discusses the data, methods of analysis, study setting, design, population and sample, the instruments, variable identification, and ethical issues. The sections of the chapter are in turn presented below starting with data.

3.2 Data

This study used DHS data from Ghana, Kenya, Rwanda and Zimbabwe. Demographic and Health Surveys are collected with funding from the United States Agency for International Development (USAID) and implemented by host countries' statistical agencies with technical support from the Inner-City Fund (ICF) Macro International Inc., widely cited as ICF International. The DHS surveys collect data from nationally representative samples on a variety of socioeconomic aspects including fertility, maternal and child health, malaria, gender, nutrition and family planning (ICF International, 2016). The Data from DHS surveys have been widely used in demographic research including on fertility trends and determinants particularly in SSA where they are the most reliable and fairly regularly collected (Be-Ofuriyua and Emina, 2002; Bongaarts, 2015; Cleland et al., 2011; Gould and Brown, 1996; Indongo and Pazvakawambwa, 2012; Locoh, 2002; Potts and Marks, 2001; Upadhyay and Karasek, 2012). These scholars among others have analysed DHS data to understand fertility determinants in different SSA settings.

The DHS surveys for Ghana and Kenya, with the exception of the first ones from 1988 and 1989 respectively, were collected in 1993, 1998, 2003, 2008 and 2014. Rwanda's DHS surveys were collected in 1992, 2000, 2005, 2010 and 2014/15 while those for Zimbabwe were from 1988, 1994, 1999, 2005/06, 2010/11 and 2015. Analysing of these surveys requires that one takes note of the limitations associated with regards to the quality of the data. The early surveys DHS phases I and II from some SSA countries have been noted to have data quality issues due to misreporting of dates and ages which can negatively impact the quality of research results. Previous assessments of quality issues in DHS data have indeed highlighted the problem of age heaping whereby respondents show bias towards stating ages ending in digits zero and five (Pullum, 2006). In fertility research, age misreporting has important effect on the resulting age distribution fertility rates especially when comparing two data points with very different age distributions of women. For this study, an assessment of the quality of the data about age distributions of the women was undertaken using the Myer's Index. The Table 3.1 below presents the Myer's indices for the respective DHS surveys for each country.

Table 3.1: Myer's Indices of age misreporting in DHS data for women from Ghana, Kenya, Rwanda and Zimbabwe

Ghana	GDHS1988	GDHS1993	DGHS1998	GDHS2003	GDHS2008	GDHS2014
	15.6	12.3	12.6	10.7	12.8	9.0
Kenya	KDHS1989	KDHS1993	KDHS1998	KDHS2003	KDHS2008	KDHS2014
	10.6	8.3	9.6	7.0	9.9	9.6
Rwanda		RDHS1992	RDHS2000	RDHS2005	RDHS2010	RDHS2014
		6.8	6.8	6.8	6.8	6.8
Zimbabwe	ZDHS1988	ZDHS1994	ZDHS1999	ZDHS2005/06	ZDHS2010/11	ZDHS2015
	8.5	8.6	10.8	6.2	8.8	6.1

The quality of data was generally good for Kenya, Rwanda and Zimbabwe where the proportion of the women requiring reassignment to their correct ages were mostly below 10%. It was only Ghana which had higher indices of digit preference with the GDHS1988 having the highest. However, the differences in the Myer's Indices between the successive GDHS

surveys were very small which implies that the potentially spurious trends in demographic indicators due to improvements in data quality could not have occurred in Ghana.

The collection of DHS data is undertaken roughly at five-year intervals since inception in some countries like Ghana, Kenya and Zimbabwe and therefore provide consistent data source that can be used to track changes in fertility rates over time. Furthermore, the regular time intervals of DHS surveys allow for the investigation of the impact of changing compositional characteristics of populations and their reproductive behaviours on fertility outcomes. The impactful short-term fluctuations in the properties of the macroenvironment like political and socioeconomic instabilities which affect the family planning infrastructure (e.g. availability of contraception) can be sufficiently examined from the DHS data.

The ultimate goal of this study was to quantify the relative contributions of proximate, individual-level female and male as well as community-level factors to the marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe. Given the need to estimate impact of male, female and community-level variables on marital fertility, the suggestion by Blalock (1984) recommending the use of group means derived from individual-level socioeconomic characteristics as community-level correlates in the study of fertility makes DHS a viable data source for this study. The collection of data from female respondents about fertility-related aspects and other socioeconomic characteristics of their partners further cemented the suitability of DHS data for the two-sex modelling approach used in the study.

3.3 Methods of analysis

The goal of this research was to decompose the temporal changes in the marital fertility rates into two main components with the third being a residual. The first component was to be attributed to differences in observable compositional characteristics. The second component was to be explained by differences in estimated coefficients which measure fertility returns to the characteristics. The application of decomposition technique was predicated on the fact that normal cross-sectional multivariate regression methods are insufficient in the investigation of sources of fertility decline or increase in the case of stalling. However, there was need to build evidence on which decomposition analysis was to be based. Consequently, a four-tier statistical methodology for the estimation and analysis of fertility rates was adopted.

The quantitative techniques were selected in relation to the demands of each specific research question and its associated objective. The first tier of analytical suite concerned the estimation of fertility levels and reconstruction of trends in total marital fertility rates (TMFRs) as well as total fertility rates (TFRs). The TFRs were computed merely to provide a comparator in the understanding of marital fertility rates. Furthermore, the TFRs are the mostly cited indicator of fertility globally including in SSA, therefore comparing them to TMFRs was crucial for understanding how marital fertility has shaped fertility transitions in SSA. The estimation and reconstruction of TMFR trends enabled identification of distinct periods of fertility change which set the foundation for the application of the statistical tools which comprised the second tier of analytical suite.

The second tier of the multimethod analytical framework involved statistical tests of the significance of the linear relationships between trends in TMFRs and time in calendar years.

These tests were conducted for each the distinct periods of rapid decline in marital fertility, periods of slow decline and those characterised by stalling. The third tier involved the estimation of random effects regressions modelling the linear relationship between ASMFRs and the independent variables. This statistical suite was employed because the dependent variable was continuous. The last tier involved decomposing temporal changes in the means of ASMFRs for each of the inter-survey periods in all the four countries. Decomposition methods have been applied to the study of fertility changes over time in SSA by various scholars (Burger et al., 2012; Fuchs and Goujon, 2013; Harwood-Lejeune, 2001; Kirk and Pillet, 1998; Rutayisire et al., 2014; Shapiro and Tenike, 2015; Sibanda et al., 2003). Despite the lack of an inclusive unified methodological approach to take into account the role of male correlates, analysis of age-adjusted measure of fertility, these scholars demonstrated that decomposition methods provide a robust estimation of the impact of determinants on fertility.

Having provided an overview of the statistical methods used to obtain the results of the study in the preceding paragraphs, the empirical implementation of the respective methods is outlined below. To facilitate easy reading and by way of providing context for each of the methods, the respective research questions and associated objectives are stated for each of the four tiers of the analytical suite. For the mere purpose expositional convenience, the data analysis process is broken down into four tasks, from 1 to task 4.

Task 1: Estimation of TMFRs

Research question I*: What are the marital fertility trends of Ghana, Kenya, Rwanda and Zimbabwe?*

Research objective I*: To estimate levels and reconstruct trends of the marital fertility for Ghana, Kenya, Rwanda and Zimbabwe.*

The first task involved the application of Poisson regression to the birth history data for all the women enumerated in the Individual Recode of DHS and reported that they were in a union. The application of Poisson regression to birth history data for computing fertility rates using DHS data has already been demonstrated (Schoumaker, 2013; Schoumaker and Hayford, 2004). Poisson regression assumes the mean and variance of the outcome variable to be the same (Simkiss et al., 2016). In this study, the expected number of births when married for the duration of the reproductive period was expressed as a logarithm linked to a linear function of age group such that;

$$TMFR = 5 * \left(\exp[a] + \sum_{k=20-24}^{40-49} \exp[a + b_k]\right) \quad [4.1]$$

Where α is a constant term and *b* is the intercept. Because TMFR was obtained by multiplying ASMFRs by 5, obtaining age specific rates using Poisson regression involved exponentiating the sum of the constant term and the regression coefficients for the respective age groups that would have been obtained from;

$$\lambda_i = \exp\left[\alpha + \sum_{k=20-24}^{45-49} b_k A_{ki}\right] \quad [4.2]$$

Where A_{ki} are dummy variables for five-year age groups from 20-24 to 45-49 years with the 15-19-year age group being used as the reference category (Schoumaker, 2013). The trends in TMFRs and TFRs were reconstructed using this same method. As previously stated, this helped to provide a visual illustration of the extent to which TMFRs dominated national trends in TFRs during critical periods like those of rapid declines and stalling. The first task was carried out in Stata Version 14.2 using Schoumaker's (2013) *tfr*2 command and the results were exported to Microsoft (MS) Office Excel where final processing for presentation was carried out. The reconstructed trends of fertility rates were smoothed using three-year averages to produce less fluctuating year-on-year estimates. For countries with highly fluctuating TMFRs like Ghana

and Kenya, this resulted in lower fertility levels than those for the survey-specific point estimates although it did not alter the shape of the trends.

Task 2: Tests of significance of TMFR trends

Research question II: *How do the timing and progress of the marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe?*

Research objective II: *To comparatively analyse the timing and progress marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe.*

This task was performed through the application of linear regression whereby annual TMFRs for distinct periods were regressed against time in single calendar years. The data were the reconstructed estimates of annual TMFRs and the respective years. The distinct periods were visually determined based on the trends obtained from task 1. These periods were distinguished based on continuous relatively smooth trend, for example, a period of rapid decline as opposed to one of slow fertility decline or increase in fertility. The technique of applying linear regression to test the statistical significance of the slopes of fertility trends was demonstrated by Garenne (2011). Adapting Garenne's (2011) formulation, the trends were tested as follows;

$$\Delta TMFR_{15-49} = \alpha + \beta * t \qquad [4.3]$$

Where;

$\Delta TMFR_{15-49}$ denotes the temporal changes in the marital fertility rates for women age 15-49 years, α is a constant, β represents the slope or extent of annual decrease or increase in fertility and t stands for time in calendar years.

Task 3: Estimation of cross-sectional fertility differentials

Research question III: *To what extent do male variables and other factors explain marital fertility differentials in Ghana, Kenya, Rwanda and Zimbabwe over time?*

Research objective III: *To examine extent to which male variables and other factors explain marital fertility differentials in Ghana, Kenya, Rwanda and Zimbabwe over time.*

Multivariate random effects linear regression models were explored to fulfil the third analytical task which sought to determine the adjusted effects of the various independent variables on the marital fertility rates of the individual women from their respective clusters. A multilevel model recognises the fact that the outcome variable varies randomly at two or more levels (Parr, 1992). This means that the coefficients for one or more of the predictor variables (which includes the constant term) vary across the level 1 units (the individual women), and these coefficients are treated as random sample for the coefficients of level 2 units (the clusters).

The collection of DHS data follows from multistage sampling design. This yields samples of individuals nested in households which are in turn nested in communities defined as clusters. However, multistage sampling has been found to produce hierarchical samples which would have been selected with unequal probabilities such that the application in standard multilevel regressions result in findings that are not representative of population (Rabe-Hesketh and Skrondal, 2006). To deal with the issue of unequal selection probabilities and to generate research results that are generalisable, various authors have discussed and demonstrated the application of two-level random intercept models with sampling weights (Graubard and Korn, 1996; Korn and Graubard, 2003; Pfeffermann et al., 1998). In this study, the multilevel regressions were implemented in Stata Version 14.2 which allows the specification of the probability weights to control for the problem of unequal selection from multistage sampling as explored by Rabe-Hesketh and Skrondal (2006).

The application of multilevel modelling in this study was predicated on the need to account for cluster-level heterogeneity which has been found in previous research to affect individual-level differences in marital fertility rates (Kravdal, 2012, 2002; Parr, 1992). Taking $\boldsymbol{j}$ to represent clusters sampled with the conditional probability $\boldsymbol{\pi_j}$ for $\boldsymbol{j} = 1, \ldots, \boldsymbol{n^{(2)}}$, and $\boldsymbol{i_{15\text{-}49}}$ to represent the individual female of reproductive age 15-49 years sampled with the conditional probability $\boldsymbol{\pi_{i|j}}$ (provided her cluster was selected) for $\boldsymbol{i} = 1, \ldots, \boldsymbol{n^{(1)}}$, the two-level linear regression model with random effects at the cluster level ($n^{(2)}$) applied in this study as adapted from Breslow and Clayton (1993) can be represented as follows;

$$asmfr_{i_{15-49}j} = \beta_0 + \beta_1 x'_{i_{15-49}j} + \cdots \beta_n x'_{i_{15-49}j} + z^{(2)'}_{i_{15-49}j} + \zeta^{(2)}_j + \epsilon_{i_{15-49}j} \qquad [4.4]$$

Where $\boldsymbol{x_{ij}}$ and $\boldsymbol{z_{ij}}$ were the vectors of the individual-level and community (cluster)-level explanatory factors respectively, $\boldsymbol{\zeta_j^{(2)}}$ were the multivariate normal random effects which varied over clusters with means equal to zero and covariance matrix $\boldsymbol{\Psi}$, and $\boldsymbol{\epsilon_{ij}}$ represent the residual.

Task 4: Estimating conditional contributions to temporal fertility changes

Research question IV: *What have been the relative contributions of male and female variables to the marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe?*

Research objective IV: *To estimate the relative contributions of male and female variables on marital fertility transition in the identified four countries.*

Research question V: *What have been the drivers of marital fertility transition in Ghana, Kenya, Rwanda and Zimbabwe?*

Research objective V: *To investigate and quantify the impact of the drivers of marital fertility transitions in Ghana, Kenya, Rwanda and Zimbabwe.*

To fulfil the fourth task of data analysis, the Oaxaca-Blinder decomposition technique was applied. The Oaxaca-Blinder decomposition is a regression-based counter-factual decomposition which partitions the difference in a distributional statistic between two groups into 'explained' and 'unexplained' parts (Fortin et al., 2011). The explained part of the decomposition refers to the difference the outcome which is attributable to group differences in levels of a set of measured predictor variables, between the first and second groups (Jann and Zurich, 2008). The unexplained portion arises from differences in how the predictor (independent) variables are associated with the outcome which is represented by the distributional statistic such as the mean (Jann and Zurich, 2008). This unexplained portion would remain even if the first group were to attain the same average levels of measured predictor variables as the second group. This is because it also captures the effects of unobservable variables reported in the form of a constant (Jann and Zurich, 2008; Sen, 2014). The Oaxaca-Blinder method is frequently used in economics where it was originally developed to examine income differences between advantaged and disadvantaged groups. The rationale behind this decomposition method can be applied to the study of fertility changes over time. In this case, the decrease or increase in the mean fertility rate is expressed as a percentage-points change from the starting estimate and the contribution of each independent variable is estimated as a conditional percentage. The conditional percentage contribution measures the extent to which the level of marital fertility would decrease or increase if the time period involved underwent change in the respective determinant only.

Taking DHS1 to represent the base survey and DHS2 to represent the current survey, this study decomposed change in the average ASMFR over time as follows;

$$\Delta ASMFR = \{E(X_{DHS1}) - E(X_{DHS2})\}'\beta_{DHS2} + E(X_{DHS2})'(\beta_{DHS1} - \beta_{DHS2}) + \{E(X_{DHS1}) - E(X_{DHS2})\}'(\beta_{DHS1} - \beta_{DHS2})$$ [4.5]

Where;

$\{E(X_{DHS1}) - E(X_{DHS2})\}'\beta_{DHS2}$ = the explained part. The change in average ASMFRs (means) that was due to group differences in the predictors, that is, the endowments effect weighted by the coefficients of later DHS

$E(X_{DHS2})'(\beta_{DHS1} - \beta_{DHS2})$ = the contributions of differences in the coefficients and intercepts. Shows expected outcome in earlier survey if it had later DHS survey's coefficients,

$\{E(X_{DHS1}) - E(X_{DHS2})\}'(\beta_{DHS1} - \beta_{DHS2})$ = is the interaction term accounting for the fact that the differences in the endowments and coefficients of the two successive DHS samples exist simultaneously,

E = mean of the predictor variables [adapted from Jann and Zurich (2008)].

All the multivariate analyses were executed in Stata version 14.0. The analysis maintained consistency between third and fourth tasks by adding the option in the empirical execution of decomposition analysis that allowed for the survey sampling of DHS to be taken into consideration in the calculation of conditional percentage contributions.

3.4 Study Setting

The study setting for this study included four countries namely Ghana, Kenya, Rwanda and Zimbabwe. The rationale for choosing countries from the four sub-regions of SSA was capture the sub-regional patterning of cultural and economic properties of the region albeit to a limited extent (Cleland et al., 1994). It has been observed that the fertility transitions of SSA countries have shown strong sub-regional patterning (Caldwell et al., 1992; Cleland et al., 1994). In order to generate insightful understanding of fertility changes in SSA, one has to have some

representation of the region and this was achieved through having a country from each sub-region. It is acknowledged that countries from the same sub-region may show disparities in their socioeconomic and political environments. For instance, countries from West and Central Africa differ in terms of colonial history and dominant religious belief systems whereby some are predominantly Christian or Muslim and others have notable proportions of their populations belonging to one of the two. However, this does not diminish the fact that countries from the same sub-region tend to display related properties of their fertility transitions.

According to Watkins (1980), proper understanding of fertility changes and differentials ought to consider commonalities and disparities across societies or countries. This study achieved commonality by sampling countries from SSA, and disparities by selecting one country from each of the four geographical subregions of SSA. These countries namely Ghana, Kenya, Rwanda and Zimbabwe were specifically selected for different reasons. Ghana and Kenya were the first countries to undergo fertility transition in West and East Africa respectively while Zimbabwe was among the first countries to do so in Southern Africa.

Ghana was the first country from SSA to obtain independence from colonial rule. Kenya has been cited as a case study for investigating fertility transition in SSA in various studies, but there has been limited research on the state of marital fertility decline for such a widely studied country (Askew et al., 2017; Ezeh and Dodoo, 2001; Garenne et al., 2015; Kimuna and Adamchak, 2001; Njogu, 1991; Odwe, 2015; Wamukoya et al., 2016). Rwanda was selected in Central Africa because of its unique socio-political history characterised by sudden changes in the fertility-affecting macro environment. The 1994 genocide which resulted markedly decimated the education and health infrastructures for most of the population and the rapid

socioeconomic recovery post-2000 following the end of the genocide present an interesting case for examining how various factors affected the fertility of married women in that country. With respect to Zimbabwe, the properties making the country an interesting case for this thesis include in leadership position historically in literacy rates in SSA, being the only state from the subcontinent to conduct an unplanned rapid land reform programme which ultimately led to reduction in food production and a growing (yet undocumented) political apathy towards fertility control.

3.5 Study design

The design of this study leveraged on the dataset used which collects data from nationally representative samples of households. The DHS surveys collect data from samples of nationally representative households that have at least one woman of reproductive age group. The surveys use retrospective survey design to collect data on various demographic, health and socioeconomic indicators from households, individual women and men. The current study exploited the retrospective nature of DHS data to compute past fertility rates and reconstruct trends.

3.6 The population and sample

In this study, the study population comprised married women from SSA who are aged between 15 and 49 years and by extension, their male partners. The sample was primarily made up of women in unions who were enumerated in all the DHS surveys from Ghana, Kenya, Rwanda and Zimbabwe. Due to the two-sex modelling approach of the study, the male partners/husbands of the women were also part of the sample since their education, occupation and fertility desires were analysed. For purposes of expositional convenience, this study

regarded all women in unions as married women such that their fertility also fell under the term as marital fertility. The full description of the sample is provided in Chapter 5.

3.7 The instruments

The DHS uses three types of questionnaires namely Household questionnaire, Woman's questionnaire and Man's questionnaire. The questionnaires are standardised to allow for comparative analysis over time and across countries and are only adapted to reflect each country's population and socio-economic context. Of interest in this study were the Household and woman's questionnaires. The Household questionnaire collects data on household characteristics (cooking fuel, assets, toilet and water facilities) and household schedule (age, sex, relationship to household head, residence, parental survivorship, birth registration and education). The Woman's questionnaire collects data on several topics which include contraception, reproductive behaviour and intentions, socioeconomic status of women as well as their partners', and antenatal, delivery and post-natal care.

3.8 Variable identification

3.8.1 The dependent variable

The identification of variables for the study was guided by reviewed literature and theoretical models. The dependent variable was marital fertility which was analysed using descriptive methods as total marital fertility rates (TMFRs) and multivariate models as age-specific marital fertility rates (ASMFRs). In this study, the ASMFR describes the number of live births per woman at any given age during their reproductive career given that they are in a union from 15 to 49 years. The TMFR is derived from ASMFRs and refers to the total number of live births that a woman will give birth to by the end of her reproductive career if she remained married

and experienced given ASMFRs. The choice of TMFRs and ASMFRs ahead of measures of cumulative parities like children ever born (CEB) was predicated on two main related reasons. One of these reasons is that fertility trends of countries are reported based on estimates that are age adjusted and the CEB measure is not age adjusted. Consequently, an age adjusted measure of fertility was justifiably preferable. Linked to this is that a measure of fertility like CEB may not consistently reflect the temporal decreases and increases in fertility rates and this is demonstrated in Figure 3.1 below especially in the cases of Rwanda and Zimbabwe. The averages of CEB for Rwanda give the impression that the marital fertility rates of the country were higher in the RDHS1992 and RDHS2000 than in the RDHS2005, but this was not the case as will be shown in Chapter 5. With regards to Zimbabwe the CEB measure failed to capture the 2005-2010 stall of marital fertility transition. The ASMFRs for both Rwanda and Zimbabwe were robust to the instances of inter-survey marital fertility increases compared to CEB.

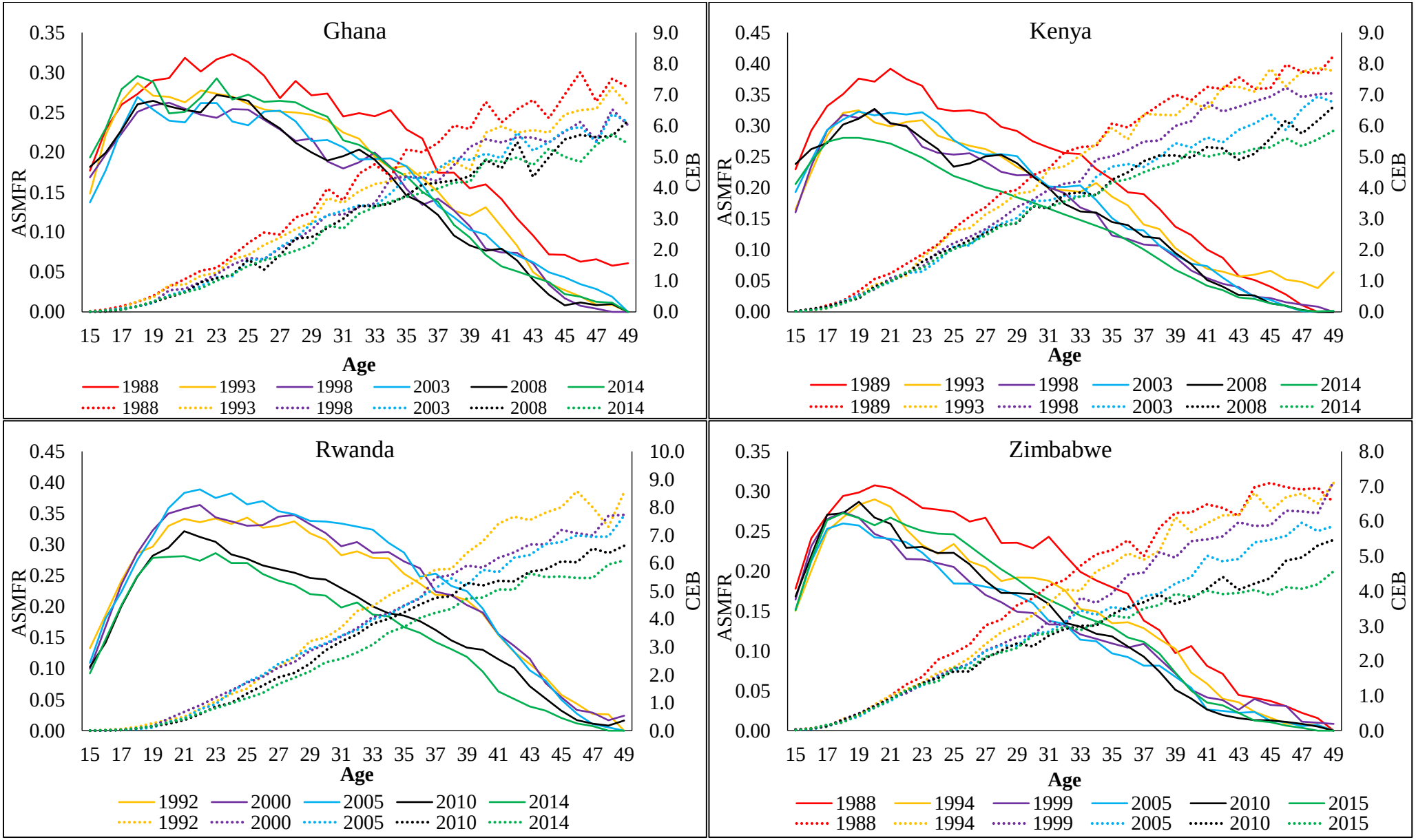


Figure 3.1: Evidence of the inconsistencies of CEB compared to ASMFRs

The inconsistencies of the CEB measure were also present in Kenya where unlike ASMFRs it failed to accurately indicate the marked downward shifts in the age distributions marital fertility rates between the KDHS1989 and KDHS1993. It was justified for this study to depart from the popular choice of using CEB when investigating the determinants of fertility rates.

The ASMFRs were computed using the *tfr*2 programme in STATA (Schoumaker, 2013; Schoumaker and Hayford, 2004). As stated above, the *tfr*2 programme computes fertility rates using Poisson regression. For this to be executed, the birth history data (shown in Figure 3.2 below) are first transformed into a person-period file (Table 3.1 below). When a woman's birth history data from the Individual Recode of DHS are transformed into person-periods, her childbearing events are recorded against the age at which she gave birth and the year when the birth occurred (Figure 3.2).

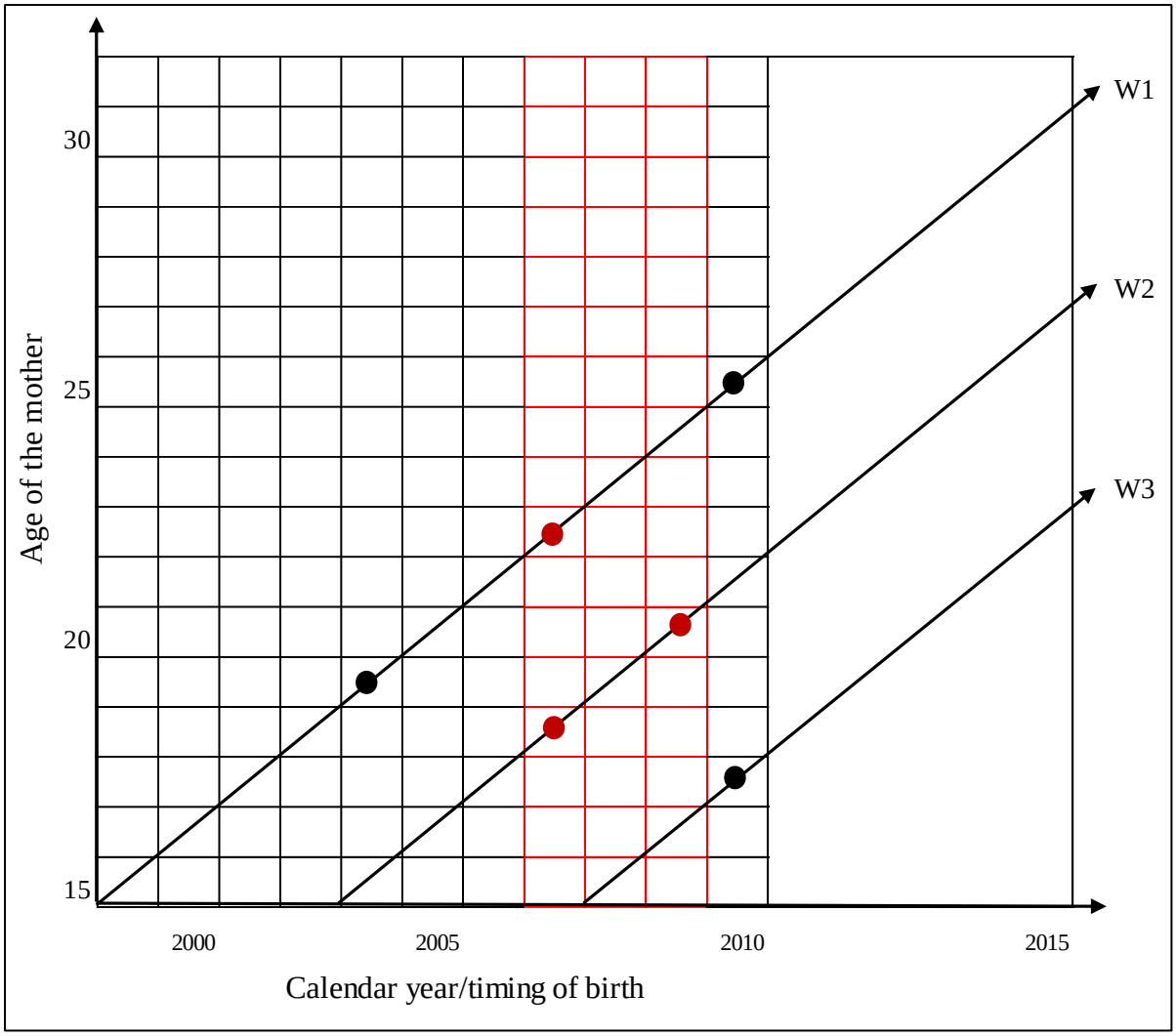


Figure 3.2: Lexis diagram illustrating birth history data for individual woman for a DHS survey conducted in 2010
Adapted from Schoumaker, 2013

Because the recommended practice when using DHS data to compute fertility rates is to use data for the three years preceding the year of the survey, one would use data from 2007, 2008 and 2009 to calculate fertility based on Figure 3.2. The relevant births and years are represented in red in the above figure. The birth histories shown in Figure 3.2 above are transformed into person-periods which gives a data table such as one shown in Table 3.2 below.

Table 3.2: Illustration of birth history data transformed into a person-period data file

Case ID	Age group	Year	Births	Exposure years	ASMFRs Ind.	ASMFRs Agg.
W1	20-24	2007	1	1	0.3333	0.5000

W1	20-24	2008	0	1	0.3333	0.5000
W1	20-24	2009	0	1	0.3333	0.5000
W2	15-19	2007	1	1	0.5000	0.2500
W2	15-19	2008	0	1	0.5000	0.2500
W2	20-24	2009	1	1	1.0000	0.5000
W3	n/a	2007	n/a	n/a	n/a	0.2500
W3	15-19	2008	0	1	0.0000	0.2500
W3	15-19	2009	0	1	0.0000	0.2500

ASMFRs Ind. = age-specific marital fertility rates for the individual woman; ASMFRs Agg. = age-specific fertility rates aggregated for the age group
Adapted from Schoumaker, 2013

It is worth noting that the *tfr*2 programme normally computes ASMFRs as an aggregate for all women in an age group, but one can make conditions for the rates to be calculated for the individual woman. This would be suitable for an investigation of the cross-sectional profile of differences in the fertility rates of women at one point in time using regression models. When one intends to investigate the underlying factors of the decrease or increase in fertility rates between two surveys, the aggregate ASMFRs are used because these are the ones used to compute TMFRs. When plotted over time, the means of the aggregate ASMFRs have the same trend as TMFRs thereby making them an appropriate proxy for investigating the factors driving the transitions of TMFRs. This was the approach employed in this study because the aim of decomposition analysis was to comparatively analyse two successive DHS surveys in the four countries studied.

3.8.2 Independent variables

The independent variables comprised proximate, socio-economic, demographic and geographic variables. Some of these were individual-level variables while others were generated at household or community-level. A total of 16 independent variables were drawn from the theoretical frameworks and reviewed literature which suggested different ways in

which fertility is affected by the various types of proximate and background determinants. Among these 16 independent variables, four were generated and these were Infant Mortality Rate (IMR), Child Mortality Rate (CMR), and community-level education status of men and women. The IMR and CMR were computed using the synthetic cohort probability method. This method uses real cohort mortality experiences to compute the mortality probabilities for small age segments. The method makes use of the most recent data and allows for computation of mortality rates for specified time periods. The community-level education statuses of men and women were generated by computing the proportion of men and women in a cluster who have completed at least secondary education. The independent variables including the form in which they were analysed, are listed in Table 3.3 below.

Table 3.3: Independent variables

Variable class	Variable name	Type	Coding
Proximate determinants	Contraceptive use	Categorical	1=none
			2=modern
			3=traditional
	Age at first union	Continuous	15-49 years
	Abortion	Dummy	0=no
			1=yes
	Postpartum infecundity	Dummy	0=no 1=yes
Background variables by sex; male and female	Education status	Categorical	0=none
			1=primary
			2=secondary
			3=tertiary
	Job status	Categorical	0=not employed
			1=skilled
			2=semiskilled
			3=agriculture
			4=unskilled
	Community-level education	Continuous	% with secondary+
	Desire for children	Categorical	0=same as wife's
			1=husband wants
			2=husband wants
Demographic variables	Age group	Categorical	0=15-19 years
			1=20-24 years
			2=25-29 years
			3=30-34 years

			4=35-39 years
			5=40-44 years
			6=45-49 years
	Infant mortality rate	Continuous	Number per 100 infants
	Child mortality rate	Continuous	Number per 100 children
Socio-geographic	Household wealth	Categorical	0=poorest
			1=poorer
			2=middle
			3=richer
			4=richest
	Religion	Categorical	0=catholic
			1=protestant
			2=pentecostal
			3=adventist
			4=apostolic
			5=other christian
			6=muslim
			7=other religion
			8=none
	Place of residence	Dummy	0=rural
			1=urban

The proximate determinants were contraceptive use, age at first union, postpartum infecundity and abortion. The relevance of these to the study of marital fertility emanates from past studies' findings. For instance, it has been found that women who use modern contraceptives have lower fertility than those who do not use any birth control methods (Bongaarts, 2017, 2015; Emina et al., 2014; Mturi and Joshua, 2011). Other important findings about contraception are that modern methods may not necessarily drive fertility transition while traditional methods are mostly used by older women who no longer want to have more children (Rossier and Corker, 2017; Udjo, 1996). With regards to abortion, Rossier and Corker (2017) found that abortion was crucial during the start of fertility transition in other regions of the world like Asia, Latin America and North America (Bongaarts and Westoff, 2000; Marston and Cleland, 2003). The variable postpartum infecundity has been proved to be a significant determinant of birth spacing and total number of children born to a woman, and even had a sustained

significant effect on individual-level fertility rates over the course of the fertility transition (Schoumaker, 2017). Given the past findings on the importance of the proximate determinants, an examination of the marital fertility transitions of SSA countries would benefit from estimating the contributions of these variables.

The demographic independent variables for this study were age group, IMR and CMR. The infant and child mortality rates were analysed at the community level. The mortality rates are an integral component of the demographic transition theory which was one of the three models which provided the theoretical underpinning for this thesis. The decline in under-5 mortality has been argued to be an important precursor to falls in fertility rates in Europe and other parts of the world (Haines, 1998). In the context of SSA, high morbidity levels are argued to have inhibited the marked decreases in fertility that should have followed the declines in under-5 mortality hence the slow demographic transition on the subcontinent (Aksan, 2014). However, the overall demographic transition of SSA conceals significant differences across countries whereby some have had significant decreases in TFRs while others are yet to begin fertility transition (Caldwell and Caldwell, 2002; Hertrich, 2017). The study of marital fertility transition in countries like Kenya and Zimbabwe which have experienced significant decreases in fertility rates would thus benefit from estimating the role of under-5 mortality (IMR and CMR) hence the inclusion of these measures of mortality in the regression equations.

The inclusion of age group in the empirical estimation equations of the study as obtained from the conceptual framework was predicated on the distribution of fertility across the reproductive life span. Many studies of fertility and other demographic outcomes have shown that age is a significant determinant of outcomes (Cavazos-Rehg et al., 2009; Garenne, 2014, 2004;

Harwood-Lejeune, 2001; Hertrich, 2017). It has been proved that fertility rates peak in the 20-24 age group in some populations and 20-29 in others (Garenne, 2014). The change in the age structure of the married population of a country therefore has important implications on the marital fertility rates. A predominantly young married population will likely have higher fertility rates compared to that which has a greater proportion of women above 30 years. The inclusion of age in this study was thus important to capture how changes in the age composition of the married populations of Ghana, Kenya, Rwanda and Zimbabwe have impacted on the trends of TMFRs of these countries.

The female and male variables were education, occupation community-level of education and desire for children. These variables have been proved to be significant predictors of fertility outcomes and transitions (Kamata et al., 2010; Kravdal, 2012, 2002). The studies that have examined male influence on fertility outcomes have also shown that education, occupation and fertility preferences of men play a significant role on the reproductive outcomes of women (Greene and Biddlecom, 2000; Hartmann et al., 2012; Kamata et al., 2010; Masudi-Uchudi, 2001). Given that the setting of the current study is highly patriarchal, it was necessary to include these male characteristics in an effort to measure the role of patriarchy on fertility transition in SSA. The current study however acknowledges that only four indicators of male characteristics may not be exhaustive in capturing the full breadth of indicators of patriarchy. Nonetheless, existing demographic literature show that male education, employment status and desire for children provide a great deal of knowledge about the impact of gender inequalities on fertility rates (Greene and Biddlecom, 2000; Hartmann et al., 2012; Kamata et al., 2010; Masudi-Uchudi, 2001)..

In the category of socioeconomic and geographic variables were household wealth which was analysed as socioeconomic status (SES), religion and place of residence. The SES of a household has important implications on the fertility outcomes of the individual woman. Previous research has shown that higher SES was associated with earlier onset of fertility transition in Europe, North America, China as well as within the SSA region (Dribe et al., 2017, 2014b, 2014a; Finlay et al., 2018; Zheng et al., 2016). These studies found that fertility transition first occurred and was more rapid among those from wealthier households and regions. The SES variable was therefore included in the empirical analysis to measure the effect of wealth transformations on the individual level fertility outcomes and the impact of this on the marital fertility transitions of the four countries.

Religious beliefs have been integral to understanding fertility dynamics especially with regards to the persistent high birth rates of SSA. The importance of religion on fertility emanates from the fact that it informs reproductive behaviours. Some belief systems like Catholicism were found to impede modern contraceptive use globally while the traditional African belief system and the Apostolic Faith Sect have been known to discourage birth control (Agadjanian and Yabiku, 2014; Gyimah et al., 2008; Mberu and Reed, 2014). As many people from SSA have gravitated towards the charismatic Christian Orthodox churches in the recent decades, it would be vital to understand how these transformations have impacted on marital fertility. The place of residence in terms of rural and urban has been proved to be a significant predictor of fertility rates. In all the countries globally and in SSA, fertility transition first occurred in urban areas with rural areas lagging behind (Garenne, 2008a; Garenne and Joseph, 2002; Shapiro and Tambashe, 2002). Furthermore, because urban areas have always had lower fertility than rural areas, faster rates of urbanisation in a country would be expected to lead to more rapid marital fertility transition. The empirical analysis of the data included the place of residence variable

to also establish the extent to which rural marital fertility changes impacted on the country-level trends compared to those for urban areas.

3.9 Ethical issues

This study did not encounter ethical issues because it was based on secondary data. The anonymity, confidentiality and consent of participants were ensured by each country's respective DHS implementing agency when the surveys were collected. The data were obtained from the Measure DHS online repository designed to host public-use data. To access this data, the prospective researcher registers a profile and fills the online application form complete with a proposed research topic and a concise description of the scope of the study. This researcher followed these steps and submitted the application, which was granted following successful vetting by Measure DHS, allowing for the download of the surveys for the four countries of interest.

CHAPTER 4 : SAMPLE DISTRIBUTION AND TRENDS OF FERTILITY RATES

4.1 Introduction

This chapter is composed of two main parts. The first part presents the cross-sectional distributions of the study sample by country from which one is able to changes in the composition over time. The second part, comprising three sub-sections, reports on the trends of fertility rates obtained from the analysis of the data. The presentation of the sample distribution follows the alphabetic order of the countries; thus, starts with Ghana followed by Kenya, Rwanda and ends with Zimbabwe. The part on fertility trends proceeds as follows; firstly, the trends in the average ASMFRs and temporal shifts in the schedules of ASMFRs are presented. The ASMFRs are presented for each five-year age group while schedules of AMSFRs are shown by survey year. Secondly, the three-year average point estimates of TMFRs and TFRs. Total fertility rates, although not the subject of enquiry in this research, were computed to provide the background picture of the national fertility trends of the countries for which the contribution of TMFRs cannot be ignored. Thirdly, the reconstructed annual marital fertility trends, for which TFRs were also used as a comparator, are presented. The last section of the results on the nature of the transitions of TMFRs identified periods of rapid decline, stalls and resumptions of the transitions is presented. A summary is then presented to round off the chapter.

4.2. Distribution of the sample

4.2.1 Sample distribution and changes over time for Ghana

Ghana has experienced incremental changes in the distribution of its married female population as depicted by the results from the analysis of the country's DHS surveys as shown in Table 4.1 below. The distribution of contraceptive use improved significantly in the sense that the proportion of women using modern methods increased over time. Meanwhile, the proportion of those who were not using any contraceptives decreased over time although this still represented an overwhelming majority by the GDHS2014. The significance of temporal changes is indicated by the 95% confidence intervals from the GDHS1988 to the GDHS2003, when the proportion of women who were not using any contraceptive methods was decreasing significantly.

The statistical significance of changes in sample distribution is established by comparing the upper bound of the confidence interval of the smaller estimate with the lower bound of the larger estimate. For instance, 86.8% of women were not using any contraceptives in the GDHS1998 and this proportion decreased to 79.6% in the GDHS1993. The lower bound of the 95% confidence interval for none use of contraceptives in the GDHS1988 was 85.1% while the upper bound for the estimate for the same category in the GDHS1993 was 81.6%. Given than 85.1% is greater than 81.6%, it means that the proportion of married women who were not using any contraceptive method significantly decreased between the 1988 and the 1993 GDHS surveys. Following this logic, it was observed that there were significant decreases in the proportions of married women who were not using contraceptives in Ghana for the first four surveys. Nonetheless, the level of non-use of contraceptives remained very high in Ghana and was above 70% as of the latest survey of 2014. Meanwhile, the use of modern

contraceptives increased significantly over the years in Ghana but was still very low at just 22% in the latest survey of 2014.

The proportion of married women in Ghana who were infecund at the time of survey collection decreased significantly between the first two GDHS surveys of 1988 and 1993, from 42.2% to 37.7%. There were virtually no further significant changes in the percentage levels of women currently infecund (breastfeeding) at each point in time represented by the 1998-2014 surveys. This implies that the proportions of married women with a recent birth remained constant for a period of more than 15 years from 1998 to 2014. With regards to abortion, there were no significant changes in the proportions of married who had ever aborted. As shown in Table 4.1 below, the proportions of those who ever aborted remained statistically the same from when data was first available in the GDHS1998 until the last survey.

Table 4.1: Sample distribution and changes over time for Ghana, DHS surveys 1988-2014 [n=21,689]

	GDHS1988 n = 3,156			GDHS1993 n = 3,204			GDHS1998 n = 3,229			GDHS2003 n = 3,694			GDHS2008 n = 2,950			GDHS2014 n = 5,456		
	Percent	95% CI		Percent	95% CI		Percent	95% CI		Percent	95% CI		Percent	95% CI		Percent	95% CI	
Contraceptive use																		
none	86.8	85.1	88.5	79.6	77.7	81.6	78.0	76.4	79.5	74.7	73.1	76.3	76.4	74.7	78.2	73.4	71.9	74.9
modern	5.4	4.3	6.5	10.1	8.9	11.4	13.5	12.2	14.7	18.8	17.3	20.3	16.7	15.2	18.3	22.1	20.7	23.5
traditional	7.8	6.6	9.0	10.3	8.9	11.6	8.6	7.5	9.6	6.5	5.6	7.4	6.8	5.8	7.9	4.5	3.8	5.3
Postpartum infecund																		
no	57.3	54.8	59.8	62.3	60.2	64.4	65.8	64.1	67.6	65.7	64.0	67.4	67.0	65.1	68.9	66.1	64.5	67.7
yes	42.7	40.2	45.2	37.7	35.6	39.8	34.2	32.4	35.9	34.3	32.6	36.0	33.0	31.1	34.9	33.9	32.3	35.5
Ever aborted																		
no							76.2	74.6	77.7	78.7	77.2	80.2	78.5	76.8	80.2	69.8	68.2	71.3
yes							23.8	22.3	25.4	21.3	19.8	22.8	21.5	19.8	23.2	30.2	28.7	31.8
Age group																		
15-19	5.5	4.6	6.4	5.0	4.2	5.7	4.0	3.3	4.7	4.0	3.3	4.7	2.7	2.1	3.4	2.0	1.5	2.4
20-24	18.7	17.4	20.0	16.9	15.5	18.3	17.4	16.0	18.8	15.1	13.7	16.4	13.8	12.4	15.3	11.5	10.4	12.5
25-29	24.0	22.3	25.7	22.0	20.5	23.4	21.6	20.1	23.1	20.7	19.2	22.2	21.3	19.6	23.0	20.0	18.7	21.4
30-34	18.1	16.8	19.4	20.4	19.0	21.8	17.6	16.2	19.0	18.6	17.2	20.0	18.9	17.3	20.6	20.2	18.9	21.6
35-39	14.8	13.5	16.1	15.6	14.4	16.9	16.8	15.4	18.2	17.3	16.0	18.7	18.8	17.2	20.4	19.5	18.2	20.8
40-44	9.8	8.8	10.9	11.4	10.3	12.5	12.7	11.5	14.0	13.6	12.4	14.9	13.2	11.8	14.6	15.4	14.2	16.6
45-49	9.1	8.0	10.2	8.8	7.6	9.9	9.8	8.7	10.9	10.6	9.5	11.7	11.2	9.9	12.5	11.4	10.4	12.5
Female education																		
none	46.2	40.9	51.5	42.3	38.0	46.6	35.7	34.0	37.4	38.1	36.4	39.9	29.5	27.7	31.3	27.9	26.6	29.3
primary	48.1	43.4	52.7	50.1	46.3	54.0	17.9	16.5	19.4	19.1	17.7	20.6	21.9	20.2	23.6	18.1	16.9	19.3
seconday	5.0	3.8	6.2	6.2	5.1	7.4	44.2	42.4	46.1	40.6	38.8	42.4	44.8	42.8	46.9	48.5	46.9	50.2
tertiary	0.7	0.3	1.2	1.4	0.8	1.9	2.2	1.6	2.7	2.1	1.6	2.7	3.7	2.9	4.6	5.4	4.6	6.2
Female occupation																		
not employed	43.7	39.8	47.7	16.3	14.5	18.1	12.1	10.9	13.3	9.3	8.3	10.4	8.4	7.2	9.5	12.7	11.6	13.8
skilled	13.4	11.5	15.2	15.0	13.3	16.7	16.1	14.8	17.5	16.1	14.7	17.4	11.7	10.3	13.0	16.7	15.5	18.0
semiskilled	31.4	28.2	34.6	26.2	23.5	28.9	39.9	38.1	41.7	35.4	33.7	37.2	46.5	44.4	48.5	43.3	41.7	45.0
agricutlture	11.1	8.7	13.5	41.8	38.0	45.7	31.9	30.1	33.6	38.9	37.1	40.6	33.4	31.5	35.3	25.9	24.6	27.3
unskilled	0.4	0.1	0.6	0.7	0.3	1.0				0.3	0.1	0.5	0.1	0.0	0.3	1.3	0.9	1.6
Religion																		
catholic	16.5	13.9	19.1	17.2	14.9	19.6	13.8	12.6	15.1	13.1	11.9	14.2	12.6	11.3	14.0	9.9	9.1	10.8
protestant	49.0	43.4	54.7	33.4	30.3	36.5	19.2	17.7	20.7	15.0	13.6	16.3	14.9	13.4	16.4	12.1	10.9	13.2
pentecostal	0.3	0.1	0.6	0.0	0.0	0.0	42.2	40.3	44.0	44.1	42.3	45.9	35.4	33.4	37.4	40.3	38.7	42.0
other religion	10.8	7.7	13.9	15.6	13.8	17.5	0.0	0.0	0.0	0.0	0.0	0.1	11.7	10.4	13.1	14.6	13.4	15.9
muslim	9.9	6.6	13.2	13.6	10.5	16.7	11.4	10.3	12.5	18.6	17.2	19.9	16.2	14.7	17.7	17.2	16.0	18.4
traditional	13.5	10.6	16.4	5.9	3.9	7.8	5.9	5.2	6.6	3.6	3.0	4.2	5.4	4.6	6.2	2.6	2.1	3.0
none				14.2	11.9	16.5	7.5	6.5	8.5	5.6	4.8	6.4	3.8	3.1	4.5	3.2	2.7	3.7
Household SES																		
poorest							23.5	22.0	25.0	21.7	20.3	23.1	20.1	18.5	21.6	19.2	18.1	20.4
poorer							18.8	17.3	20.2	19.3	17.9	20.7	20.0	18.4	21.6	18.0	16.8	19.2
middle							18.0	16.5	19.4	19.3	17.9	20.8	18.3	16.7	19.9	18.8	17.5	20.0
richer							18.6	17.2	20.1	19.3	17.8	20.8	20.8	19.1	22.5	20.3	18.9	21.7
richest							21.1	19.5	22.6	20.4	18.8	21.9	20.8	19.1	22.6	23.7	22.1	25.2
Place of residence																		
rural	70.1	63.0	77.1	68.5	63.5	73.5	30.8	29.1	32.6	40.7	38.8	42.5	42.1	40.0	44.1	50.1	48.4	51.7
urban	29.9	22.9	37.0	31.5	26.5	36.5	69.2	67.4	70.9	59.3	57.5	61.2	57.9	55.9	60.0	49.9	48.3	51.6
Husband's education																		
none	32.5	26.6	38.4	32.8	28.1	37.5	23.3	21.9	24.8	30.1	28.5	31.7	22.9	21.3	24.6	20.4	19.2	21.6
primary	49.2	44.6	53.7	46.4	42.9	49.9	8.3	7.3	9.4	7.5	6.6	8.4	7.9	6.9	9.0	9.7	8.8	10.6
seconday	13.6	11.6	15.6	13.7	12.0	15.5	59.8	58.0	61.6	54.1	52.3	55.9	58.7	56.7	60.7	57.6	56.0	59.2
tertiary	4.7	3.5	5.9	7.1	5.8	8.3	8.5	7.5	9.6	8.3	7.2	9.4	10.4	9.1	11.7	12.4	11.2	13.5
Husband's occupation																		
not employed	1.6	1.1	2.0	2.4	1.9	3.0	1.1	0.7	1.5	2.1	1.6	2.6	0.5	0.3	0.8	0.8	0.5	1.0
skilled	31.9	28.0	35.9	22.0	19.8	24.2	30.6	28.8	32.3	33.3	31.5	35.1	30.9	29.0	32.9	31.6	30.0	33.2
semiskilled	12.7	10.4	14.9	15.4	13.4	17.3	21.7	20.1	23.3	14.2	12.9	15.6	25.0	23.2	26.9	14.1	12.9	15.3
agricutlture	51.8	46.0	57.6	53.2	49.1	57.3	46.7	44.9	48.5	49.5	47.7	51.4	42.9	40.9	44.9	36.5	35.0	38.0
unskilled	2.0	1.4	2.5	7.0	5.8	8.1	0.0	0.0	0.0	0.8	0.5	1.2	0.6	0.3	1.0	17.1	15.8	18.4
Husband's desire for children																		
same				49.8	47.3	52.3	64.3	62.5	66.0	61.5	59.7	63.3	59.9	57.9	61.9	55.3	53.6	56.9
more				45.6	42.9	48.3	31.1	29.4	32.7	32.3	30.6	34.0	31.8	29.9	33.7	34.6	33.1	36.2
less				4.6	3.8	5.5	4.7	3.9	5.5	6.2	5.3	7.1	8.3	7.2	9.5	10.1	9.1	11.1
Community-level variables																		
IMR	76	71	82	66	63	68	55	55	56	63	63	64	49	48	49	40	40	41
CMR	154	145	162	118	112	124	104	103	105	109	108	110	76	75	78	59	58	59
Community education F	6.4	4.9	7.9	8.5	7.1	9.8	49.3	48.3	50.4	46.1	45.0	47.2	54.3	53.2	55.4	60.1	59.2	60.9
Community education M	18.1	15.5	20.8	21.3	18.9	23.7	68.2	67.1	69.2	62.2	61.0	63.4	69.3	68.0	70.6	69.8	68.9	70.7

There was evidence of shifts in the age distribution of currently married women in Ghana. Looking at the overall picture involving all the surveys, the age composition of the married female population shifted towards comprising more mature women. The proportions of women who were in the 15-19, 20-24 and 25-29-year age groups decreased over time and were significantly lower in the GDHS2014 than in the GDHS1988. Meanwhile, the proportions of the those who belonged to the 30-34-year age group were higher in the GDHS2014 compared to the GDHS1988. These shifts in the age distribution of the married female population arguably points at a delay of first marriage by women in Ghana.

There was a general increase in the female education status of women in Ghana. An estimated 94% of married women enumerated in the GDHS1988 had either just primary (48.1%) or no (46.2%) education at all. At the same time, only 5% had secondary education and less than 1% had attained tertiary education. This education status profile of the Ghanaian married female population significantly changed over time with marked gains in secondary education which accounted for 48.1% in the GDHS2014. However, the proportion of those with no education was still high at 27.9% while tertiary education attainment at just 5.4% is still very low among married women in Ghana.

The distribution of women by occupation status in Ghana changed over time especially with regards to shift from exclusion to inclusion in the employment market. In the GDHS1988, a considerable proportion of the women (43.7%) were not employed, but the share of this category decreased over time. Meanwhile, the proportion of those in skilled professions remained low over time with about two percentage-points increase in the GDHS2014 compared to the GDHS1988 level. There were only 11.1% of married women in agriculture jobs in the

GDHS1988 and by the GDHS1993, as much as 41.8% of the women in marriages were involved in agriculture jobs. The subsequent surveys however, depicted long-term decreases in the proportions of women involved in agriculture jobs.

Ghana's sample distribution by religious beliefs showed a long-term decrease in the proportions of women who were Catholic or Protestant. These decreases occurred while the prevalence of the Pentecostal religious beliefs grew from being nearly non-existent in the GDHS1988 to more than 40% in the GDHS2014. With respect to household wealth status, there were limited shifts in the distribution of the sample over time. At the successive inter-survey level, the household wealth status composition for Ghana largely remained stable. However, the incremental improvements culminated in significantly less proportions of married women living in poorest and poorer households in the GDHS2014 than in the GDHS1988. There were commensurate increases in the proportions of women in richer and richest households. Nonetheless, improvements in the level of household wealth were arguably subdued in Ghana, suggesting that the material conditions at the household level within which marital fertility occurs have not markedly improved since the 1980s.

The level of urbanisation in the Ghana sample as at GDHS2014 was 50%, implying that the married female population of the country was distributed equally between rural and urban areas. This represented a 20 percentage-points change from the rural-urban distribution of residence that prevailed in the 1980s. As shown in Figure 4.1, 70% of married women enumerated in the GDHS1988 were living in rural areas while only 30% were residing in urban areas. The largest shift in this rural-urban distribution occurred between the GDHS1993 and

GDHS1998 when the proportion urban rose from 31.5% to 69.2%. The period starting in the noughties decade was however characterised by reductions in proportions living in urban areas.

The distribution of women based on husband's education status was characterised by significant changes over time with the largest shifts involving primary and secondary education. In the GDHS1988, almost half of the women (49.2%) were married to men with primary education only. By the GDHS2014, the proportion of women married to husbands with primary education was less than 10%. Meanwhile, the proportion of women married to husbands with secondary education was 13.6% in the GDHS1988 and increased continually until reaching 56% in the GDHS2014. The level of tertiary education for husbands did not increase markedly over the years just like for women.

Regarding husband's employment characteristics, the only notable changes in the sample distribution involved agriculture and unskilled employment. The first GDHS survey showed that 51.8 and 2.0% of the women were married to husbands employed in agriculture and unskilled jobs respectively. These respective proportions changed over time such that by the GDHS2014 the proportion of women with husbands in agriculture jobs had decreased to 36.5% while those whose husbands were in unskilled jobs had increased to 17.1%. With regards husband's desire for children, there were increases the proportions of women whose husbands desired less children. This was also the case with the proportions of women with husbands who desired less children than the women. Community-level indicators revealed significant transformations occurring in Ghana. There were significant decreases in the rates of infant and child mortality while community-level education status of women and husbands significantly increased from the GDHS1988 to GDHS2014. It should be noted that the infant and child

mortality rates reported in Table 4.1 and for the other countries were computed per 1000 live births.

4.2.2 Sample distribution and changes over time for Kenya

The sample distribution for Kenya shown in Table 4.2 below underwent significant changes from the first to the last survey. Looking at contraceptive use, the KDHS1989 showed that 72.5% of the married women were not using any contraceptives while 18.4 and 9.2% were using modern and traditional methods respectively. This distribution continuously changed over time such that as at the KDHS2014, over 50% of the married women were using modern contraceptives while the proportion of those not using any methods had decreased to 40.2%. With regards to the other proximate variables, results in Table 4.2 show that postpartum infecundity also underwent significant changes while abortion remained constant. The proportion of married women who were infecund decreased for the two KDHS surveys of 1993 and 1998 but increased in the KDHS2003 from the KDHS1998 level before decreasing again in the last two surveys of 2008 and 2014.

Table 4.2: Sample distribution and changes over time for Kenya, DHS surveys 1989-2014 [n=43,161]

	KDHS1989 n = 4,778			KDHS1993 n = 4,583			KDHS1998 n = 4,847			KDHS2003 n = 4,876			KDHS2008 n = 5,041			KDHS2014 19,036		
	Percent	95% CI		Percent	95% CI		Percent	95% CI		Percent	95% CI		Percent	95% CI		Percent	95% CI	
Contraceptive use																		
none	72.5	70.8	74.2	67.1	65.6	68.7	60.9	59.3	62.4	60.5	59.0	62.0	54.0	52.0	56.0	41.5	40.2	42.9
modern	18.4	16.9	19.8	27.4	26.0	28.9	31.6	30.1	33.1	31.6	30.2	33.1	40.0	38.0	42.0	53.8	52.4	55.1
traditional	9.2	8.0	10.3	5.4	4.7	6.2	7.5	6.6	8.4	7.9	7.0	8.7	6.0	5.0	7.1	4.7	4.1	5.3
Postpartum infecund																		
no	57.0	55.2	58.8	62.1	60.5	63.7	65.2	63.6	66.7	62.0	60.5	63.5	65.8	63.9	67.7	68.7	67.4	70.0
yes	43.0	41.2	44.8	37.9	36.3	39.5	34.8	33.3	36.4	38.0	36.5	39.5	34.2	32.3	36.1	31.3	30.0	32.6
Ever aborted																		
no							88.6	87.6	89.6	85.5	84.4	86.6	87.2	86.0	88.4	87.3	86.3	88.2
yes							11.4	10.4	12.4	14.5	13.4	15.6	12.8	11.6	14.0	12.7	11.8	13.7
Age group																		
15-19	5.8	4.9	6.6	5.7	4.9	6.4	5.9	5.1	6.6	6.8	6.0	7.6	4.3	3.5	5.1	3.5	3.0	4.0
20-24	17.4	16.1	18.8	20.3	19.0	21.6	19.6	18.3	20.8	19.7	18.4	20.9	19.4	17.8	21.0	16.7	15.6	17.8
25-29	23.6	22.0	25.1	21.7	20.3	23.0	22.2	20.9	23.6	21.5	20.3	22.8	22.1	20.4	23.9	25.1	23.8	26.3
30-34	17.4	16.0	18.8	19.8	18.5	21.1	17.0	15.8	18.2	17.7	16.5	18.9	19.7	18.0	21.3	19.8	18.7	21.0
35-39	16.2	14.8	17.7	13.8	12.7	15.0	17.3	16.1	18.5	14.0	12.9	15.1	14.1	12.7	15.4	15.7	14.7	16.7
40-44	11.9	10.7	13.2	11.2	10.2	12.3	10.6	9.6	11.6	12.4	11.4	13.5	11.1	9.8	12.4	10.5	9.6	11.3
45-49	7.7	6.7	8.7	7.5	6.6	8.4	7.4	6.6	8.2	7.9	7.0	8.7	9.4	8.3	10.4	8.7	8.0	9.5
Female education																		
none	31.2	29.5	33.0	22.6	21.2	24.0	14.1	13.0	15.2	15.4	14.3	16.5	10.6	9.5	11.6	9.0	8.4	9.6
primary	51.5	49.6	53.3	56.2	54.5	57.8	58.1	56.6	59.7	58.4	56.9	59.9	58.9	56.9	60.9	54.2	52.7	55.6
seconday	16.9	15.6	18.2	20.7	19.4	22.1	25.5	24.0	26.9	20.7	19.4	21.9	23.7	21.8	25.6	27.2	25.9	28.6
tertiary	0.3	0.2	0.5	0.5	0.3	0.8	2.3	1.7	2.8	5.5	4.8	6.2	6.8	5.9	7.7	9.6	8.7	10.5
Female occupation																		
not employed	90.0	88.9	91.0	45.2	43.6	46.9	37.7	36.1	39.2	31.3	29.8	32.7	33.1	31.2	35.0	25.2	24.0	26.5
skilled	10.0	9.0	11.1	7.4	6.5	8.3	7.7	6.9	8.6	5.1	4.5	5.8	25.3	23.5	27.0	10.6	9.6	11.5
semiskilled				20.0	18.7	21.3	18.4	17.2	19.7	19.0	17.8	20.3	9.3	8.0	10.6	9.9	9.0	10.7
agricutlture				25.2	23.8	26.6	33.6	32.1	35.2	38.4	36.9	40.0	29.1	27.4	30.9	28.2	27.0	29.4
unskilled				2.1	1.6	2.6	2.5	2.0	3.0	6.1	5.4	6.9	3.1	2.3	3.9	26.1	24.8	27.4
Religion																		
catholic	34.7	32.9	36.5	30.7	29.2	32.2	27.4	26.0	28.9	24.2	22.8	25.6	20.6	19.0	22.2	19.4	18.2	20.5
other christian	57.2	55.3	59.0	59.9	58.2	61.5	64.6	63.1	66.2	65.1	63.7	66.6	68.7	66.9	70.5	71.7	70.5	73.0
muslim	3.4	2.8	4.1	4.8	4.1	5.5	5.0	4.3	5.7	8.2	7.5	8.9	7.8	7.0	8.6	6.7	6.2	7.3
none	3.1	2.4	3.7	3.7	3.1	4.3	2.1	1.7	2.5	2.2	1.8	2.6	2.4	1.9	2.9	1.8	1.5	2.1
other religion	1.6	1.1	2.1	1.0	0.7	1.3	0.9	0.6	1.2	0.3	0.1	0.5	0.6	0.4	0.8	0.4	0.2	0.5
Household SES																		
poorest				19.8	18.5	21.1	21.3	19.9	22.6	19.3	18.1	20.5	17.1	15.8	18.5	16.7	15.8	17.5
poorer				20.9	19.6	22.2	19.6	18.4	20.9	19.3	18.1	20.6	18.0	16.5	19.5	17.9	16.9	18.9
middle				18.8	17.6	20.1	18.7	17.5	19.9	18.7	17.4	19.9	19.4	17.9	20.9	19.2	18.1	20.3
richer				19.6	18.3	21.0	18.9	17.7	20.2	19.5	18.2	20.8	20.6	19.0	22.2	21.6	20.4	22.8
richest				20.8	19.5	22.2	21.5	20.1	22.8	23.2	21.9	24.5	24.9	22.9	26.8	24.7	23.3	26.0
Place of residence																		
rural				85.3	84.1	86.5	79.2	77.9	80.6	77.8	76.6	79.1	76.5	74.6	78.5	60.8	59.3	62.2
urban				14.7	13.5	15.9	20.8	19.4	22.1	22.2	20.9	23.4	23.5	21.5	25.4	39.2	37.8	40.7
Husband's education																		
none	16.3	14.8	17.7	12.2	11.1	13.3	8.4	7.5	9.3	10.8	9.9	11.8	7.7	6.8	8.6	6.6	6.1	7.1
primary	50.9	49.1	52.8	52.3	50.7	54.0	49.0	47.4	50.6	49.5	47.9	51.0	48.5	46.5	50.6	48.2	46.8	49.6
seconday	31.2	29.5	32.9	33.7	32.2	35.3	37.5	35.9	39.1	29.6	28.2	31.0	33.0	31.0	35.0	31.4	30.1	32.7
tertiary	1.6	1.2	2.0	1.8	1.3	2.2	5.1	4.3	5.8	10.1	9.1	11.0	10.7	9.6	11.9	13.9	12.8	14.9
Husband's occupation																		
not employed	2.1	1.5	2.6	2.1	1.6	2.5	2.9	2.3	3.4	0.8	0.5	1.0	0.4	0.2	0.6	1.3	1.0	1.6
skilled	25.0	23.4	26.6	27.5	26.0	29.0	21.1	19.7	22.4	15.4	14.3	16.5	40.1	38.1	42.0	28.3	27.0	29.6
semiskilled	30.2	28.5	31.8	23.3	21.9	24.7	23.6	22.3	25.0	23.4	22.1	24.7	9.6	8.3	10.9	7.7	6.9	8.4
agricutlture	36.7	34.8	38.5	35.2	33.7	36.8	33.6	32.1	35.1	34.9	33.4	36.4	30.7	28.9	32.6	22.0	21.0	23.1
unskilled	6.1	5.2	7.0	11.9	10.8	12.9	18.9	17.6	20.1	25.5	24.1	26.8	19.2	17.6	20.8	40.7	39.3	42.1
Husband's desire for children																		
same				55.1	53.5	56.7	57.1	55.5	58.6	50.0	48.5	51.6	57.0	55.0	59.0	58.7	57.3	60.1
more				38.1	36.5	39.7	33.9	32.4	35.4	39.8	38.3	41.4	37.3	35.3	39.2	33.4	32.1	34.7
less				6.8	6.0	7.6	9.0	8.1	9.9	10.1	9.2	11.1	5.7	4.9	6.6	7.9	7.1	8.7
Community-level variables																		
IMR	61	60	62	61	60	62	73	71	74	76	75	77	51	51	52	39	39	39
CMR	91	89	92	96	94	97	110	108	112	112	110	114	72	71	74	52	52	52
Community education F	18.8	18.2	19.3	22.5	21.9	23.1	27.6	26.9	28.3	26.5	25.8	27.1	32.9	32.0	33.8	40.7	40.0	41.4
Community education M	32.3	31.6	32.9	34.8	34.0	35.6	42.0	41.2	42.9	39.6	38.8	40.4	43.6	42.5	44.6	45.8	45.0	46.6

The age distribution of the Kenya sample experienced small changes over the years. Looking at the entire period, the proportions of the married women who were 25-29 and 30-34 years had increased by the time of KDHS2014 collection compared to the levels observed in the KDHS1989. The shares of the other age groups decreased over time. With regards to female education, the proportion of women with no education decreased significantly while the proportions of those with primary, secondary and tertiary education increased. However, more than 60% of the women in Kenya had primary education or less in the last survey. Those with tertiary education were still a minority in the latest KDHS survey of 2014. These results show that educational attainment among married women in Kenya remains very low. The lack of notable positive gains in education status among married women has a bearing on employment characteristics of this segment of the Kenyan population. Table 4.2 above shows that a minority of the married women are employed in skilled professions in all the surveys for which data were available with the exception of the KDHS2008. The majority of the women who were enumerated in the latest survey for Kenya were employed in either agriculture or unskilled jobs.

The prevalence of the Catholic religion decreased in Kenya just like in Ghana. An estimated 34.7% of the women enumerated in the KDHS1989 were Catholics while 57.2% were in the other Christian religions. In the subsequent surveys, the proportion who were Catholic decreased while for those in the other Christian religions increased. The shares of the Muslim religion, other religions and none accounted for a minority of the sample in Kenya at all times. With regards to household SES, there were notable improvements as the proportions of women residing in households from the two lowest wealth quantiles decreased significantly over time. This occurred as the two highest wealth quantiles accounted for increased coverage of households where married women resided. The overall increase in the percentage of women

living in richest households from the highest income quantile was statistically significant especially when comparing the first and last KDHS surveys. Looking at place of residence, there were significant increases in proportions residing in urban areas over time. In the KDHS1989, only 14.7% of the married women were living in urban areas while 85.3% were rural residents. The distributions in the subsequent surveys revealed inverse trends whereby the share of rural residence was declining while that for urban residence was increasing. Nonetheless, the latest KDHS survey from 2014 showed that the majority of the married women resided in rural areas.

The distribution of the Kenya sample by education status of husbands showed significant changes only in respect of tertiary and no education. The proportion of women with husbands who had no education was 16.3% in the KDHS1989 and this decreased over time to reach 6.6% in the KDHS2014. Meanwhile, the proportion of those whose husbands had tertiary education increased from less than 2% in the KDHS1989 to reach 13.9% in the KDHS2014. There were no notable changes in the proportions of women married to men with primary or secondary education. Just like for females, there was also limited improvements in male education status when looking at the married population of Kenya. There however differences between males and females with regards to occupation. Almost all the husbands of the women were employed at each of the KDHS survey years. There was a considerably greater proportion of males who were in skilled professions compared to the females. The proportion of women with husbands in semiskilled and agriculture jobs decreased over time with commensurate increases occurring in the proportion whose husbands were involved in unskilled jobs.

A greater proportion of women reported that their husbands has similar desires for children as them. This share of the sample increased from the 55.1% in the KDHS1993 and stood at 58.7% in the latest survey collected in 2014. Barring the estimate from the KDHS2003, there was a long-term decrease in the proportion of women reporting that their husbands desired to have more children. Infant and child mortality rates initially increased in Kenya over a period covered by the first four KDHS surveys. These increases especially child mortality rates were statistically significant. By the time of KDHS2008 collection, the mortality rates had started to decrease and were significantly lower in the last survey compared to the first KDHS survey. The community-level education status increased in Kenya for both males and females with the former showing higher educational attainment at all surveys.

4.2.3 Sample distribution and changes over time for Rwanda

Rwanda experienced marked temporal shifts in the composition of the married sample in terms of contraceptive use and other variables. The results reported in Table 4.3 below show that in the RDHS1992, the proportion of women who were not using any contraceptive method was 78.8% while users of modern and traditional methods constituted 12.9 and 8.3% of the sample. The 2000 and 2005 RDHS surveys had even higher proportions of married women who were not using any contraceptives with the respective percentage shares for the categories of modern and traditional methods being lower than in the RDHS1992. There were however significant positive changes especially involving the RDHS2010 relative to the RDHS2005 survey. The proportions of women using modern contraceptives significantly increased from the RDHS2005 level of 10.2% to 45.2% in the RDHS2010. The same period saw the proportion of those who were not using contraceptives decrease from 82.7% in the RDHS2005 to 48.4% in the RDHS2010.

Table 4.3: Sample distribution and changes over time for Rwanda, DHS surveys 1992-2014 [n=27,771]

	RDHS1992 n = 3,698			RDHS2000 n = 4,891			RDHS2005 n = 5,458			RDHS2010 n = 6,834			RDHS2014 n = 6,890		
	Percent	95% CI		Percent	95% CI		Percent	95% CI		Percent	95% CI		Percent	95% CI	
Contraceptive use															
none	78.8	77.5	80.2	87.3	86.2	88.4	82.7	81.7	83.8	48.4	47.1	49.6	46.7	45.5	47.9
modern	12.9	11.8	14.0	5.3	4.6	6.0	10.2	9.3	11.0	45.2	44.0	46.5	47.5	46.3	48.8
traditional	8.3	7.4	9.2	7.4	6.5	8.2	7.1	6.4	7.8	6.4	5.8	7.0	5.8	5.2	6.3
Postpartum infecund															
no	37.7	36.0	39.3	41.9	40.3	43.5	39.0	37.6	40.3	48.6	47.4	49.8	54.6	53.4	55.9
yes	62.3	60.7	64.0	58.1	56.5	59.7	61.0	59.7	62.4	51.4	50.2	52.6	45.4	44.1	46.6
Ever aborted															
no				79.5	78.1	80.8	79.1	77.9	80.3	80.8	79.8	81.7	80.5	79.5	81.5
yes				20.5	19.2	21.9	20.9	19.7	22.1	19.2	18.3	20.2	19.5	18.5	20.5
Age group															
15-19	3.1	2.5	3.7	3.4	2.8	4.0	1.2	0.9	1.5	1.3	1.0	1.6	1.2	0.9	1.5
20-24	16.3	15.1	17.6	18.2	16.9	19.4	18.0	16.9	19.1	14.5	13.6	15.3	12.7	11.8	13.5
25-29	21.2	19.9	22.6	21.9	20.5	23.2	22.7	21.5	23.9	25.7	24.6	26.8	22.6	21.5	23.6
30-34	22.4	21.0	23.8	18.1	16.8	19.3	20.3	19.1	21.4	21.2	20.2	22.2	24.3	23.2	25.3
35-39	16.0	14.8	17.2	16.7	15.4	17.9	14.7	13.7	15.7	16.1	15.2	17.0	17.8	16.8	18.7
40-44	12.8	11.7	13.9	13.4	12.3	14.5	13.3	12.3	14.2	11.3	10.5	12.0	12.8	12.0	13.7
45-49	8.1	7.2	9.0	8.5	7.6	9.4	9.8	9.0	10.7	10.0	9.3	10.7	8.6	7.9	9.3
Female education															
none	45.9	44.3	47.6	37.0	35.4	38.6	29.5	28.2	30.8	19.6	18.7	20.6	16.5	15.6	17.5
primary	48.7	47.0	50.4	54.4	52.7	56.0	62.0	60.6	63.4	69.9	68.7	71.0	70.5	69.3	71.6
seconday	5.2	4.5	5.9	8.3	7.4	9.2	8.0	7.2	8.7	9.0	8.3	9.7	10.3	9.6	11.1
tertiary	0.2	0.1	0.3	0.3	0.1	0.5	0.5	0.4	0.7	1.5	1.2	1.8	2.7	2.3	3.1
Female occupation															
not employed	2.2	1.8	2.6	0.3	0.1	0.4	18.8	17.7	19.9	9.7	9.0	10.4	5.8	5.2	6.4
skilled	2.4	1.9	2.9	3.4	2.8	4.0	2.6	2.2	3.1	3.8	3.3	4.3	5.3	4.8	5.8
semiskilled	2.0	1.6	2.4	5.0	4.3	5.7	4.2	3.6	4.7	6.5	5.9	7.1	10.8	10.1	11.6
agricutlture	93.2	92.5	94.0	91.0	90.1	91.9	73.4	72.1	74.6	77.1	76.1	78.1	75.9	74.9	77.0
unskilled	0.1	0.0	0.2	0.3	0.2	0.5	1.0	0.8	1.3	2.9	2.5	3.3	2.1	1.8	2.5
Religion															
catholic							46.6	45.2	48.0	42.1	40.9	43.3	38.0	36.8	39.2
protestant							36.8	35.5	38.2	40.3	39.1	41.5	45.9	44.6	47.1
adventist							13.1	12.2	14.1	14.3	13.5	15.2	12.8	12.0	13.7
muslim							1.7	1.4	2.1	1.4	1.2	1.7	2.1	1.7	2.4
other religion							0.8	0.6	1.1	1.0	0.8	1.3	0.8	0.6	1.0
none							0.9	0.6	1.1	0.8	0.6	1.1	0.4	0.2	0.5
Household SES															
poorest	22.7	21.3	24.1	37.5	35.9	39.1	20.7	19.6	21.9	19.5	18.5	20.4	18.9	17.9	19.8
poorer	20.4	19.0	21.8	12.4	11.3	13.5	20.4	19.3	21.6	20.1	19.2	21.1	21.0	20.0	22.1
middle	19.8	18.4	21.1	19.6	18.4	20.9	20.3	19.1	21.5	20.4	19.4	21.3	20.8	19.8	21.8
richer	18.7	17.4	20.0	15.2	14.0	16.3	20.9	19.8	22.1	20.6	19.6	21.6	19.8	18.8	20.8
richest	18.4	17.1	19.6	15.3	14.1	16.4	17.6	16.6	18.7	19.4	18.5	20.4	19.5	18.6	20.5
Place of residence															
rural	95.0	94.6	95.4	89.5	88.5	90.5	87.0	86.1	87.8	86.7	85.9	87.5	82.9	82.0	83.8
urban	5.0	4.6	5.4	10.5	9.5	11.5	13.0	12.2	13.9	13.3	12.5	14.1	17.1	16.2	18.0
Husband's education															
none	33.2	31.6	34.8	33.4	31.9	35.0	26.9	25.7	28.2	19.3	18.3	20.3	16.9	16.0	17.9
primary	60.6	59.0	62.3	56.3	54.7	57.9	61.6	60.2	63.0	68.0	66.8	69.1	70.3	69.2	71.5
seconday	5.5	4.8	6.2	9.3	8.3	10.2	10.4	9.5	11.2	10.6	9.8	11.3	9.2	8.5	9.9
tertiary	0.7	0.5	0.9	1.0	0.7	1.3	1.1	0.8	1.4	2.2	1.8	2.5	3.5	3.1	3.9
Husband's occupation															
not employed	0.4	0.2	0.6	0.8	0.5	1.1	0.1	0.0	0.2	0.9	0.7	1.2	0.9	0.7	1.1
skilled	8.9	7.9	9.8	13.0	11.9	14.1	12.9	12.0	13.9	14.5	13.6	15.3	20.2	19.2	21.2
semiskilled	4.3	3.7	4.9	4.1	3.5	4.8	4.9	4.3	5.5	8.2	7.5	8.8	10.0	9.3	10.7
agricutlture	81.8	80.5	83.0	80.8	79.6	82.1	77.4	76.2	78.5	70.5	69.4	71.6	62.9	61.7	64.1
unskilled	4.7	4.0	5.4	1.2	0.8	1.5	4.7	4.1	5.3	5.9	5.4	6.5	6.0	5.4	6.6
Husband's desire for children															
same	71.3	69.8	72.8	38.4	36.8	40.0	38.6	37.3	40.0	59.3	58.1	60.5	60.5	59.3	61.7
more	15.6	14.4	16.8	53.4	51.8	55.0	42.9	41.4	44.3	23.5	22.5	24.6	22.1	21.1	23.1
less	13.1	12.0	14.2	8.2	7.3	9.1	18.5	17.4	19.6	17.2	16.3	18.1	17.4	16.5	18.4
Community-level variables															
IMR	85	85	86	107	107	108	86	86	87	50	50	50	32	32	32
CMR	151	150	152	197	195	198	153	152	154	75	75	76	50	50	50
Community education F	6.9	6.6	7.2	7.9	7.6	8.3	8.2	7.9	8.5	14.7	14.4	15.1	21.3	21.0	21.7
Community education M	6.1	5.8	6.3	10.4	9.9	10.8	11.4	11.0	11.8	12.7	12.3	13.1	12.7	12.3	13.1

The levels of postpartum infecundity underwent notable changes in Rwanda as the proportions of those who were infecund decreased over time. As shown in Table 4.3 above, 62.3% of the women enumerated in the RDHS1992 had a recent birth hence infecund. This distribution did not change significantly in the 2000 and 2005 RDHS surveys but marked shifts occurred post 2005 with the RDHS2010 and RDHS2014 levels showing notably lower proportions infecund relative to the earlier surveys. With respect to the proportions who have ever aborted, there were no significant changes in the four surveys for which data were available.

The age distribution of the Rwanda sample remained fairly stable from the first to the last RDHS survey. Most of the women were aged between 30 and 44 years with the 15-19-year age group which accounted for less than 5% constituting a minority of the total number of women in all the RDHS surveys. The changes in the education status composition of the Rwanda sample were mainly in relation to primary education and none. The first survey of the country showed that 45.9% of the married women had no education while 48.7% had primary education only. A minority of the women had secondary or tertiary education in the RDHS1992. Over time, there were modest increases in the proportions of women with secondary or tertiary education such that by the RDHS2014, only 10.3% and 2.7% had secondary and tertiary education respectively.

Despite the RDHS2014 showing significantly greater proportions with secondary and tertiary education compared to the RDHS1992, they still represented minimal improvements in female educational attainment. Primary educational attainment continuously increased at succeeding survey, reaching 70.5% in the RDHS2014. These increases followed inverse trends with proportions without any formal education which continuously decreased from the RDHS1992

level to reach 16.5% in the RDHS2014. The education profile for Rwanda reflect continued lack of access to education opportunities especially beyond primary school which has a negative bearing on other life outcomes. The employment characteristics of the sample for Rwanda highlighted the limited opportunities for married women in the Rwanda in the face of low educational attainment. An overwhelming majority of the women in Rwanda were involved in agriculture jobs with the 1992 and 2000 RDHS surveys having more than 90% in such jobs. Although there were decreases in the post-2000 surveys, the majority of the women at more than 70% continued to be found in agriculture jobs.

Looking at sample distribution by religious beliefs in Rwanda, it was observed that the temporal changes mainly involved the Catholic and Protestant religions. In the RDHS1992, 46.6% of the women were Catholics while 36.8% were Protestants. The changes from these proportions involved Protestant religion gaining in prevalence with that of the Catholic religion decreasing. By the time of RDHS2014 collection, 38% of the women were Catholics while the proportion who were Protestant had increased to 45.9%. The distribution of women in the RDHS surveys by household SES was biased towards the lower quantiles. This can be observed in the fact that about 43% of the women in the RDHS1992 lived in households from the two lowest wealth quantiles. The succeeding survey from 2000 showed negative shifts with those from poorest households alone constituting more than 37% of the total sample. This increases occurred as proportions from poorer, richer and richest households significantly decreased. These shifts arguably reflect negative macro socioeconomic trends in Rwanda at the time. In the RDHS surveys from 2005 and later years, there were almost similar proportions of women from each of the five household wealth quantiles. The rural-urban distribution of the Rwanda sample was heavily skewed towards rural residence throughout the 1992-2014 period despite some statistically significant changes. At the time of collection of the RDHS1992, 95% of the

women in marriages were living in rural areas and this decreased to 89.5 and 87% in the two succeeding surveys collected in 2000 and 2005 respectively. These modest decreases continued into the last RDHS survey with commensurate increases in the proportions living in urban areas.

The characteristics of the husbands of the women enumerated in the Rwanda surveys underwent significant temporal changes. This is reflected in the temporal shifts in the distribution of the women according to husband's occupation. The results reported in Table 4.3 show that 81.8% of the women enumerated in the RDHS1992 had male partners employed in agriculture jobs. A very small minority of the women in the RDHS1992 had husbands who were not employed while those with husbands employed in skilled and semiskilled jobs constituted 8.9 and 4.3% of the sample respectively. There were moderate changes to this RDHS1992 distribution in the subsequent surveys with the most notable changes occurring in the 2010 and 2014 surveys when the proportions with husbands employed in agriculture jobs decreased markedly. Nonetheless, the distribution of women by husband's occupation was characterised by predominance of marriages involving men outside of formal skilled professions.

With respect to husband's desire for more children, the results from the first three RDHS surveys showed an increase in the proportion of women whose partners wanted more children. This was more pronounced in the RDHS2000 (53.4%) when more than half of the women had husbands who desired more children. The trend post 2000 was one of long-term decrease in this category of women, and notable increases in the proportions of women reporting that they desired the same number of children as their husbands. In all the RDHS surveys, the

proportions of women with husbands desiring less children constituted a minority despite long-term temporal increases.

The Rwanda sample underwent notable temporal changes in the community-level features from the RDHS1992 until the RDHS2014. Looking at mortality rates, IMR and CMR were respectively 85 and 151 deaths per 1000 live births in the RDHS1992. The infant and child mortality rates increased significantly from the RDHS1992 levels to 107 and 197 deaths per 1000 live births in the RDHS2000 respectively. The levels of both measures of under-five mortality decreased significantly for all the post-2000 surveys starting in the RDHS2005. By the RDHS2014, IMR and CMR stood at 32 and 50 deaths per 1000 live births respectively. Community-level indicators of education status depicted low educational attainment for both women and their husbands. This was in spite of the significant increases the average educational attainment for both sexes especially involving the last three RDHS surveys. With respect to female education, there were less than 10% with secondary education or higher as late as 2005. Meanwhile, there was less than 15% of the total number of women reporting that their husbands had secondary education or higher.

4.2.4 Sample distribution and changes over time for Zimbabwe

The temporal changes in the composition of the Zimbabwe sample based on the standardised thus comparable successive cross-sectional ZDHS surveys reflected a population undergoing significant transformations. The composition of the sample based on proximate determinants significantly changed over time in directions that can be considered reflective of positive shifts especially with respect to contraceptive use and proportions who reported postpartum infecundity (Figure 4.4 below).

Table 4.4: Sample distribution and changes over time for Zimbabwe, DHS surveys 1988-2015 [n=29,257]

	ZDHS1988 n = 2,973			ZDHS1994 n = 3,469			ZDHS1999 n = 4,203			ZDHS2005-06 n = 6,154			ZDHS2010-11 n = 6,543			ZDHS2015 n = 6,015		
	Percent	95% CI		Percent	95% CI		Percent	95% CI		Percent	95% CI		Percent	95% CI		Percent	95% CI	
Contraceptive use																		
none	57.2	55.3	59.0	50.4	48.6	52.2	50.3	48.6	52.0	46.7	45.2	48.2	47.2	45.9	48.6	33.0	31.6	34.4
modern	36.4	34.7	38.2	43.8	42.0	45.6	46.9	45.2	48.6	51.8	50.4	53.3	51.7	50.4	53.1	66.0	64.6	67.4
traditional	6.4	5.5	7.3	5.8	5.0	6.6	2.8	2.3	3.4	1.5	1.2	1.8	1.1	0.8	1.4	1.0	0.7	1.3
Postpartum infecund																		
no	67.9	66.2	69.6	71.8	70.2	73.4	74.9	73.4	76.3	75.0	73.7	76.4	73.3	72.1	74.5	74.3	73.0	75.6
yes	32.1	30.4	33.8	28.2	26.6	29.8	25.1	23.7	26.6	25.0	23.6	26.3	26.7	25.5	27.9	25.7	24.4	27.0
Ever aborted																		
no				82.6	81.3	84.0	85.8	84.6	86.9	87.9	86.9	88.9	87.3	86.4	88.2	83.4	82.3	84.6
yes				17.4	16.0	18.7	14.2	13.1	15.4	12.1	11.1	13.1	12.7	11.8	13.6	16.6	15.4	17.7
Age group																		
15-19	6.5	5.6	7.4	7.3	6.4	8.3	7.7	6.8	8.6	7.5	6.7	8.4	7.2	6.4	7.9	7.0	6.3	7.8
20-24	19.8	18.3	21.3	21.4	19.9	22.9	21.8	20.4	23.2	21.7	20.5	22.9	20.1	19.0	21.2	17.2	16.1	18.3
25-29	20.8	19.2	22.3	19.4	18.0	20.8	22.0	20.6	23.4	20.8	19.6	22.0	22.1	20.9	23.2	20.8	19.5	22.0
30-34	19.0	17.5	20.4	19.0	17.6	20.4	15.0	13.8	16.2	18.1	16.9	19.3	17.6	16.6	18.6	21.6	20.4	22.9
35-39	15.0	13.6	16.3	13.7	12.4	14.9	14.4	13.2	15.5	12.3	11.4	13.2	14.2	13.3	15.2	15.7	14.6	16.8
40-44	10.1	9.0	11.2	11.1	10.0	12.2	10.8	9.8	11.8	10.6	9.7	11.5	10.1	9.3	10.9	11.5	10.6	12.5
45-49	8.8	7.8	9.9	8.1	7.1	9.0	8.3	7.4	9.2	9.0	8.1	9.9	8.7	8.0	9.5	6.2	5.5	6.9
Female education																		
none	16.4	15.0	17.8	12.9	11.8	14.1	8.8	7.9	9.7	5.7	4.8	6.5	3.0	2.5	3.4	1.5	1.1	1.9
primary	62.2	60.4	64.1	52.8	51.0	54.6	46.2	44.6	47.9	37.5	36.1	39.0	32.2	31.0	33.5	29.9	28.5	31.2
seconday	20.6	19.1	22.1	32.4	30.7	34.1	42.0	40.3	43.7	53.6	52.1	55.1	60.6	59.3	62.0	62.2	60.8	63.7
tertiary	0.7	0.4	1.0	1.9	1.4	2.5	3.0	2.4	3.6	3.2	2.7	3.7	4.1	3.6	4.7	6.4	5.7	7.2
Female occupation																		
not employed				39.3	37.5	41.0	39.4	37.8	41.1	52.0	50.5	53.5	53.1	51.8	54.5	46.0	44.5	47.5
skilled				16.9	15.5	18.3	12.1	11.0	13.2	8.4	7.6	9.1	4.8	4.2	5.4	8.8	7.9	9.6
semiskilled				14.7	13.4	16.0	21.7	20.3	23.1	16.6	15.5	17.7	19.2	18.1	20.3	29.6	28.2	31.0
agricutlture				27.9	26.3	29.4	25.8	24.4	27.2	19.0	17.8	20.1	11.2	10.3	12.0	13.2	12.2	14.2
unskilled				1.2	0.8	1.6	1.0	0.7	1.3	4.0	3.5	4.5	11.7	10.8	12.5	2.3	1.9	2.8
Religion																		
catholic	65.7	64.0	67.5	55.1	53.4	56.9	95.7	95.0	96.4	9.5	8.6	10.3	7.4	6.7	8.1	5.5	4.8	6.2
protestant	32.8	31.0	34.5	41.1	39.4	42.9	4.0	3.4	4.7	23.7	22.5	25.0	15.8	14.8	16.8	13.7	12.7	14.8
pentecoatsal	1.5	1.1	2.0	3.8	3.1	4.4	0.3	0.1	0.5	16.3	15.2	17.4	19.1	18.1	20.2	22.5	21.2	23.7
apostolic										32.3	30.8	33.7	42.2	40.9	43.6	47.0	45.5	48.5
other christian										5.8	5.1	6.5	7.4	6.7	8.0	4.3	3.8	4.9
other religion										3.5	3.0	4.0	1.3	1.0	1.6	1.1	0.8	1.4
none										8.9	8.1	9.8	6.8	6.1	7.4	5.7	5.0	6.4
Household SES																		
poorest				19.8	18.4	21.1	18.7	17.5	19.9	19.2	18.0	20.5	18.8	17.8	19.8	19.5	18.3	20.6
poorer				16.6	15.3	17.9	17.6	16.4	18.8	18.8	17.6	20.0	19.0	18.0	20.1	19.5	18.4	20.7
middle				19.1	17.7	20.5	18.3	17.1	19.6	18.0	16.9	19.2	19.6	18.5	20.8	17.8	16.6	18.9
richer				22.2	20.7	23.7	23.1	21.6	24.6	23.2	22.0	24.5	22.6	21.4	23.7	22.9	21.6	24.2
richest				22.4	20.8	24.0	22.2	20.7	23.7	20.7	19.5	21.9	19.9	18.8	21.0	20.3	19.1	21.5
Place of residence																		
rural	68.9	67.2	70.6	69.8	68.1	71.6	63.7	62.0	65.4	65.5	64.1	66.9	66.0	64.7	67.4	66.4	65.0	67.8
urban	31.1	29.4	32.8	30.2	28.4	31.9	36.3	34.6	38.0	34.5	33.1	35.9	34.0	32.6	35.3	33.6	32.2	35.0
Husband's education																		
none	12.0	10.8	13.2	7.5	6.6	8.4	5.7	5.0	6.5	4.3	3.6	5.0	2.5	2.1	2.9	1.4	1.1	1.8
primary	54.6	52.8	56.5	49.1	47.3	50.9	37.0	35.5	38.6	28.5	27.1	29.9	21.0	20.0	22.1	21.6	20.4	22.8
seconday	31.7	30.0	33.4	38.8	37.1	40.6	50.7	49.0	52.3	60.9	59.4	62.3	69.5	68.3	70.7	66.6	65.2	68.0
tertiary	1.6	1.2	2.1	4.5	3.7	5.3	6.6	5.7	7.5	6.3	5.7	7.0	7.0	6.3	7.7	10.3	9.4	11.2
Husband's occupation																		
not employed	2.4	1.8	2.9	2.1	1.5	2.6	11.7	10.7	12.8	6.8	5.9	7.8	13.9	13.0	14.8	15.5	14.4	16.5
skilled	28.4	26.7	30.1	33.5	31.8	35.2	32.2	30.6	33.8	35.3	33.9	36.7	32.2	30.9	33.4	39.4	38.0	40.9
semiskilled	23.8	22.2	25.4	23.2	21.7	24.8	25.6	24.1	27.1	21.0	19.8	22.1	16.3	15.3	17.3	26.0	24.7	27.4
agricutlture	24.2	22.6	25.8	23.9	22.4	25.4	17.3	16.1	18.5	25.6	24.3	27.0	18.5	17.4	19.5	15.0	13.9	16.0
unskilled	21.3	19.8	22.8	17.3	15.9	18.6	13.2	12.1	14.3	11.3	10.4	12.2	19.1	18.1	20.2	4.1	3.5	4.7
Husband's desire for children																		
same				47.7	45.9	49.5	48.7	47.0	50.4	56.0	54.5	57.5	59.2	57.8	60.5	50.5	49.0	52.0
more				27.5	25.9	29.1	35.2	33.6	36.8	35.6	34.1	37.1	31.8	30.6	33.1	32.4	31.0	33.8
less				24.8	23.3	26.4	16.1	14.8	17.3	8.4	7.6	9.2	9.0	8.2	9.8	17.1	16.0	18.2
Community-level variables																		
IMR	45	45	46	52	51	53	65	64	65	59	59	60	57	56	57	50	50	50
CMR	70	69	70	76	75	77	102	101	102	82	82	83	84	84	85	69	68	69
Community education F	29	28.3	29.7	40.4	39.5	41.2	50.9	50.1	51.7	60.7	59.9	61.5	67.7	67.2	68.3	70.5	69.8	71.1
Community education M	33.1	32.3	33.9	43.4	42.7	44.1	57.2	56.4	58	67.1	66.4	67.8	76.5	76	76.9	77.1	76.4	77.7

The results presented in Figure 4.4 above illustrate the positive changes in contraceptive use and levels of infecundity. As shown in the Figure, more than half (57.2%) of the married women in the ZDHS1988 were not using any contraceptives with only 36.4% on modern methods. Although the proportion using modern contraceptives was higher at this period compared to the other countries presented above, it still represented low usage of effective birth control technologies. The succeeding ZDHS1994 showed downward shift in the proportion who were not using contraceptives (50.4%) while that for users of modern contraceptives (43.8) increased compared to the ZDHS1988 levels. The prevalence of modern contraceptive use continued to increase in the subsequent surveys while those for none use and traditional methods were decreasing. By the ZDHS2015, 66% of the married women were using modern contraceptives while about 32% were not using any methods. The use of traditional methods of birth control had virtually disappeared with only a minority of women (1%) reporting that they were using these methods.

Looking at postpartum infecundity, there were long-term significant changes despite that the inter-survey shifts were not always significant. The long-term shifts mainly involved increases in the proportions of women who did not have a recent birth (who were fecund) while those with recent births (infecund) decreased. These shifts imply that the proportion of married women with recent births for the post-2000 era was significantly less than for the pre-1990 period. There were no significant changes in the levels of women reporting to have ever aborted, and this potentially implies that trends in marital fertility rates may have not been subject to compositional changes in abortion characteristics.

The age distribution of the married female sample for Zimbabwe was fairly stable over time, undergoing small incremental changes at the inter-survey level. In most of the ZDHS surveys, the modal age groups that accounted for greater proportions of the married women were 20-24 and 25-29 years. These age groups accounted for at least 40% of the total number of women for all the surveys except the ZDHS2015 where the 30-34-years was the modal age group followed by the 25-29-year age group which together accounted for 42% of the married female sample for the survey. It is worth observing that despite constituting a small proportion for all the surveys, the 15-19-year age group experienced increased prevalence over time in Zimbabwe unlike in the other countries.

The composition of the Zimbabwe sample based on female characteristics underwent significant temporal changes with regards to education and employment. The profile of the women by education status had greater positive shifts compared to the other countries but there was also lack of marked increases in tertiary educational attainment. The results in Table 4.4 show that the ZDHS1988 had 62.2% of the women reporting primary education status while 20.6 and 16.4% had secondary and no education respectively. The results from the subsequent surveys showed temporal decreases in proportions without education and with primary only while those with secondary education increased markedly at each survey relative to the preceding survey. By the ZDHS2015, almost all married women had primary or higher education with less than 2% reporting that they did not have any education. An estimated 62.2% of the ZDHS2015 sample had secondary education. However, a considerable 29.9% of the women had primary education only, signifying a real concern of lack of access to secondary and post-secondary education for women in Zimbabwe given that less than 7% had tertiary education. The lack of post-secondary education remained a major characteristic of the Zimbabwe sample from the ZDHS1988 until the ZDHS2015. The first ZDHS survey had less

than 1% of married women reporting tertiary education status, and despite statistically significant increases in this proportion for the succeeding surveys, tertiary education remained a characteristic for a minority of the women in the ZDHS2015 where it accounted for just 6.4% of the women.

The results on the employment characteristics of the women from the Zimbabwe surveys revealed discouraging temporal changes. The proportions of women who were not employed having been 39.3% in the ZDHS1988, were higher for all the subsequent surveys relative to the first survey. This category accounted for more than half of the married women in the 2005-06 (52%) and 2010-11 (53.1) ZDHS surveys before dropping to 46% in the ZDHS2015. The trend in women employed in skilled jobs reflected significant decreases in the proportions of women in this category from the 16.9% level of the ZDHS1988 such that by the time of ZDHS2015 collection, only 8.8% of married women reported employment in skilled jobs. There were also successive significant decreases in proportions of women involved in agriculture jobs. The only long-term partially positive trend was the proportion of those in semiskilled jobs, from 14.7% in the ZDHS1988 to 29.6% in the ZDHS2015. This was partially positive because it reflects increased involvement in formal employment but highlights stifled access to skilled professions for married women which can be linked to lack of access to post-secondary educational training.

The distribution of the Zimbabwe sample by religious beliefs showed an interesting picture; there was transition towards religious plurality in the country. The first three ZDHS surveys showed that the Catholic religion accounted for the majority of the sample with significantly more than half of the women, ranging between 65 and 96%, in each survey reporting that they

were Catholic. It can however be stated that these Figures may have been partly influenced by the data collection instruments which may not have been sufficiently adapted to capture the various religious belief systems existing in the country. This is demonstrated by the sudden decrease in the prevalence of the Catholic religion from 95.7 to 9.5% between the 1999 and 2005-06 ZDHS surveys and the emergence of the Apostolic religion (32.3%) which now accounted for more than a third of the total ZDHS2005-06 sample. It is probable that most of these people were erroneously coded as Catholic in previous surveys. Nonetheless, the study observed evidence suggesting significant temporal shifts in the distribution of the Zimbabwe sample and population at large in terms of religious belief systems. The dominant religion in the country for the last three surveys was the Apostolic religion which significantly increased continuously over time.

The household SES composition for Zimbabwe reflected skewness towards greater wealth for households compared to what was observed in the other countries. For all the ZDHS surveys, the two highest wealth quantiles accounted for more than 40% of the women. This distribution was fairly stable across the whole period which to an extent reflects the lack of positive household wealth transition in the country. There were also limited changes in rural-urban residence. Throughout the 1988-2015 period covered by the ZDHS surveys, the proportion of married women living in urban areas never exceeded 35%, suggesting a lack of urbanisation in Zimbabwe particularly with regards to the married women.

There were changes in the distribution of the women by education status of husbands in ZDHS surveys which potentially reflected better educational outcomes for men compared to women. This was in terms of decreases in proportions of those with primary education or less while

secondary educational attainment significantly increased. As shown in Table 4.4, more than half of the women (54.6%) in the ZDHS1988 were married to men with primary education only and 31.7% had husbands educated up to secondary level. A minority of the women (1.6%) in the same survey had husbands with tertiary education while husbands of 12% of the women had no education. This compositional profile by husband's education status was transformed over timed such that by the last ZDHS survey of 2015, 21.6% were married to men with primary education only while 66.6 and 10.3% had husbands with secondary or tertiary education respectively. There was less than 2% of the women whose husbands did not have any education.

The distribution of the sample for Zimbabwe by husband's occupation reflected a notable distinction between men and women with respect to access to skilled jobs. There was a statistically significant long-term increase in the proportion of women reporting that their husbands were employed in skilled jobs. Between the 1988 and 2015 ZDHS surveys, this proportion increased by close to 11 percentage-points from 28.4% to 39.4%. There were decreases in the proportions of women with husbands involved in semiskilled, agriculture and unskilled jobs over the period covered by ZDHS surveys. The same period also saw significant increases in the proportions of women with husbands who were not employed, from less than 3% in the ZDHS1988 to more than 15% in the ZDHS2015.

With regards to husband's desire for children, there was significant increase in the proportion of women reporting that their husbands desired more children. As shown in Figure 5.4, 27.5% of the ZDHS1988 sample had husbands who desired more children. This percentage was significantly greater at each of the subsequent ZDHS surveys ranging from 31.8% to 35.6%.

Meanwhile, there was a significant decrease in the proportion of women whose husbands desired less children. This proportion notably decreased from 24.8% in the ZDHS1998 to 16.1% and later 8.4% in the 1999 and 2005-06 ZDHS surveys respectively. A rebound in the share of this category was observed in the last ZDHS survey of 2015 where it accounted for 16% of the women, a rise from 9% for the ZDHS2010-11.

The trends of infant and child mortality rates in Zimbabwe were comparable to those observed in the other countries presented in the previous sections with regards to the trajectories of increases before decreasing trend. There were increases in the rates of these two mortality measures involving the first three ZDHS surveys, after which there were decreases over time. At the peak period covered by the ZDHS1999, IMR was 65 deaths per 1000 live births while CMR reached 102 deaths per 1000 live births. An interesting observation for mortality rates for Zimbabwe is that the country never had lower rates for all its post-1990 surveys than those observed in the ZDHS1988. As will be shown in the next chapter, the ZDHS1988 did however recorded the highest TMFRs and TFRs compared to the other surveys implying occurrence of fertility transition irrespective of increased infant and child mortality rates.

4.3. Fertility rates

4.3.1 Trends and schedules of ASMFRs

The ASMFRs help understanding the underlying changes in the age-distribution of marital fertility that cannot be determined from analysis of TMFRs. For the results reported in this section, clustering of the lines of ASMFR schedules signify small temporal decrease or increase

in marital fertility from one survey to another while bigger gaps imply that there were marked inter-survey changes in the levels of ASMFRs. Unlike in the previous sections, the results for this section are presented per country for organisational purposes, starting with Ghana followed by Kenya, Rwanda and ending with Zimbabwe.

The trends and schedules of ASMFRs for Ghana are presented in Figure 4.1 below. The graph of ASMFRs for Ghana reflect the nature of temporal age distribution of fertility rates characterised by instances of fast and slow decline as well as stalling. The schedule of ASMFRs for GDHS-1988 was markedly higher than that from the following survey of 1993. This means that between these two surveys, there were considerable declines in the fertility rates of all age groups in Ghana. There was also a notable gap between the 1993 and 1998 levels of ASMFRs with the latter having lower rates, signifying continued fertility decline. These results are consistent with reconstructed trends of TMFRs presented in Figure 4.5. The post-2000 GDHS surveys suggest lack of further gains in marital fertility transition from the levels that had been reached by the year 1998. This is because the schedules of ASMFRs for the 2003, 2008 and 2014 GDHS surveys were clustered closely to each other and mostly slightly above the GDHS-1998 levels.

Trends in the ASMFRs presented in Figure 4.1 show the average levels of marital fertility rates for each age group over time, creating synthetic fertility cohort trends.

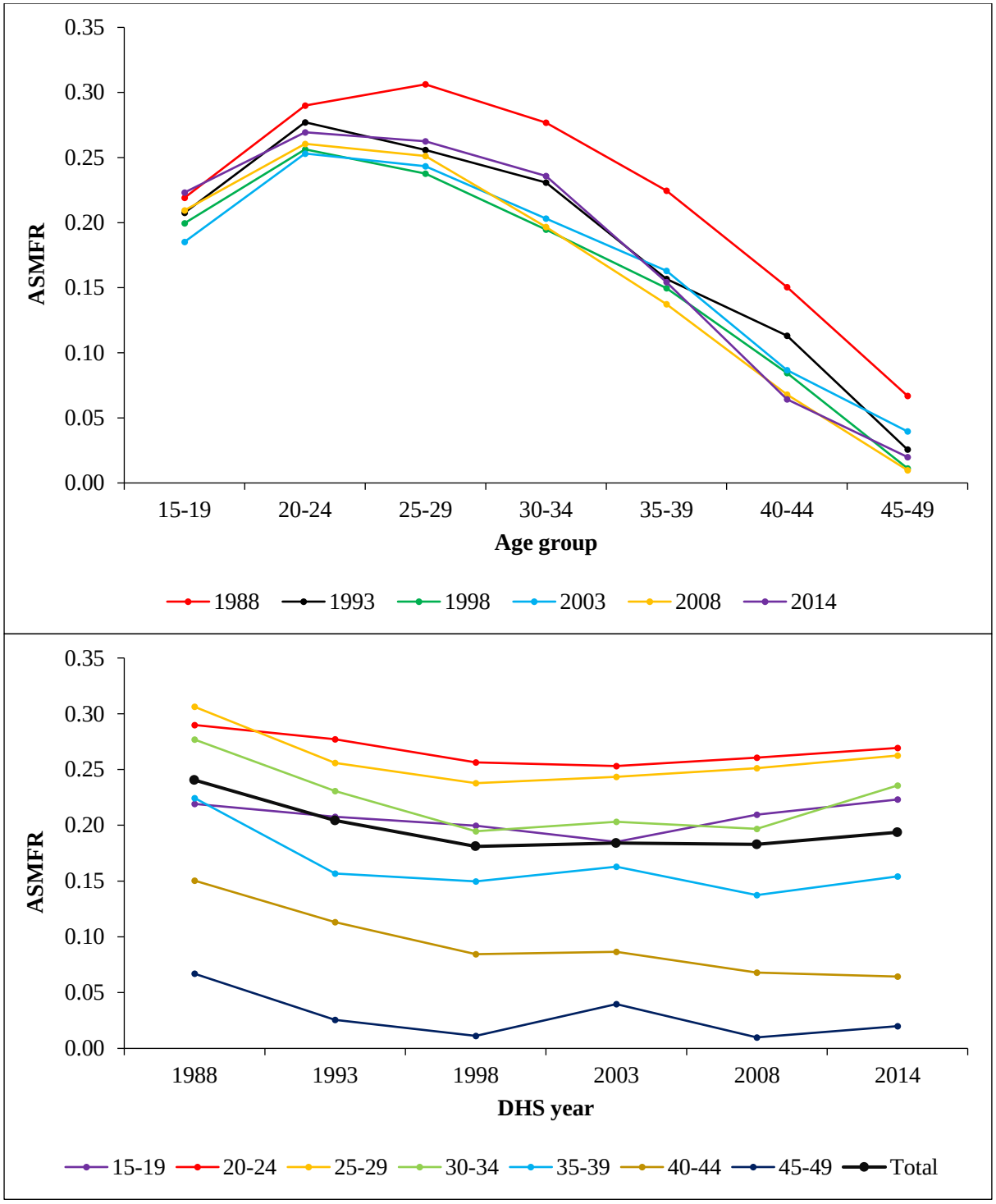


Figure 4.1: Temporal changes in the schedules of ASMFRs for Ghana, DHS data.

Based on Figure 4.1 above, the level of ASMFRs for the 20-24-year age group in Ghana did not change markedly between the GDHS1988 and GDHS2014 with the two surveys having 0.29 and 0.27 respectively. Peak fertility occurred in the 20-24 and 25-29-year age groups

throughout the history of marital fertility transition in Ghana, and these two age groups experienced stalling since the early 2000s which lasted until the last GDHS survey. Despite experiencing considerable ASMFRs declines in the period covered by the first three surveys, the 30-34-year age group also experienced stalling as the fertility rates of this age group rebounded after the 1998 survey. There was little transition in the fertility rates of 15-19-year old women as gains made in the first four surveys were reversed in the latest two GDHS surveys. The three oldest age groups namely 35-39, 40-44 and 45-49 were the ones that appear to have experienced no reversals in transition and had consistently lower fertility than the national average. It can be drawn from the results reported in Figure 5.3 that the stalling of marital fertility in Ghana was influenced by the failure of sustained declines in the 15-19, 20-24, 25-29-year age groups particularly post 2000.

The trends and age schedules of marital fertility for Kenya shown in Figure 4.2 below displayed a different picture from that observed in Ghana. While results for Ghana point to rebound in the fertility rates of the younger age groups when comparing the last GDHS survey with some of the earlier surveys, those for Kenya display evidence of markedly lower ASMFRs for all age groups in the KDHS2014 than KDHS1989 except for 15-19 years. There was a large gap between the age schedules of marital fertility between the first two KDHS surveys followed by a smaller gap between the second and third surveys. These gaps reflect the extent to which ASMFRs declined between the surveys and are consistent with results on trends in TMFRs. All age groups except the 45-49 years experienced increased levels of fertility between the 1998 and 2003 surveys.

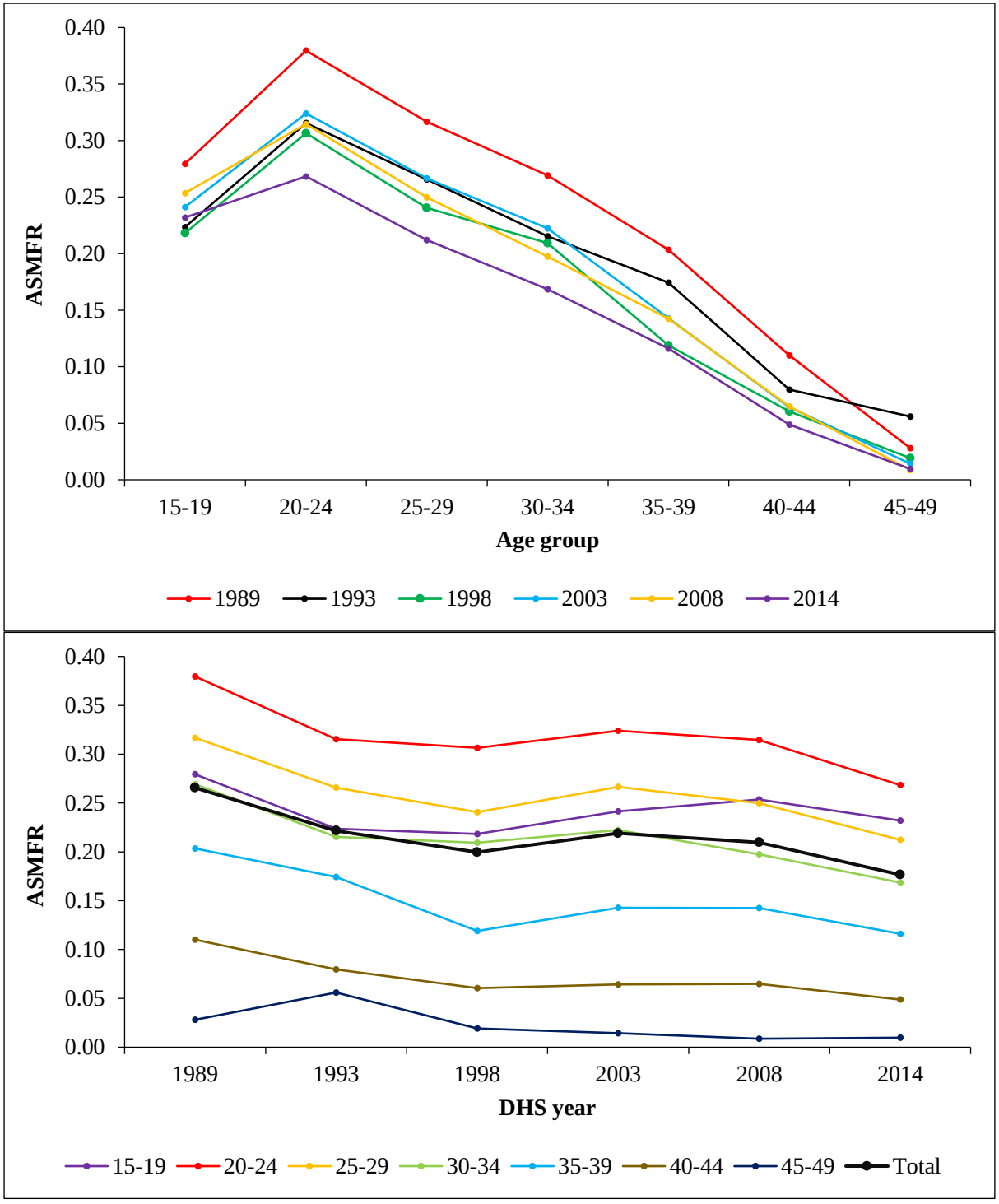


Figure 4.2: Temporal changes in the schedules of ASMFRs for Kenya, DHS data.

The resumption of TMFR transition captured in the 2008 KDHS following the stalling involving the KDHS2003 appear to have been driven by declines in the fertility rates of 20-24, 25-29 and 30-34-year age groups. This is because it was only the ASMFRs for these age groups

that were lower in the KDH2008 compared to the preceding KDHS2003. The tempo of ASMFRs for Kenya showed throughout the history of fertility transition in Kenya that median rates occurred in the 30-34-year age group and were mostly close to the mean rates. Just like in Ghana, the ASMFRs for the three oldest age groups were consistently below the national average. However, Kenya's ASMFRs differed from those of Ghana in that it was only the 20-24 and 25-29-year age groups which consistently had rates above the national average with those of 15-19-year olds also proving to be notably higher than the average from the KDHS1998 survey onwards. The results for Kenya imply that most of the marital fertility in the country is concentrated among young women below 30 years. These age groups have arguably been responsible for influencing the national trends in TMFRs for Kenya. This is reflected in the trends of ASMFRs for these age groups which proved to be similar with those found for national-level TMFRs.

The magnitude of the fertility rates of women aged 40 years and above was very small to have any significant effect on national trends in Kenya. The 45-49-year age group was the only one to experience an increase in fertility between the first two surveys when all other age groups were experiencing rapid declines. Meanwhile, the ASMFRs of 40-44-year olds showed a subdued gradual downward trend for most of the inter-survey periods and were barely consistent with national-level trends. It therefore means that an understanding of Kenya's marital fertility behaviour over time can be drawn based on women below 35 years. This is because the fast decline in rates for this segment of married women was mirrored in the national fertility trends as was also the case with stalling and resumption of fertility transition.

The ASMFRs for Rwanda displayed a unique picture of the relationship between age and marital fertility compared to the other three countries. The schedules of ASMFRs presented in Figure 4.3 below reflect increases in fertility rates in the first two inter-survey periods followed by a marked sudden decline between the second and third surveys.

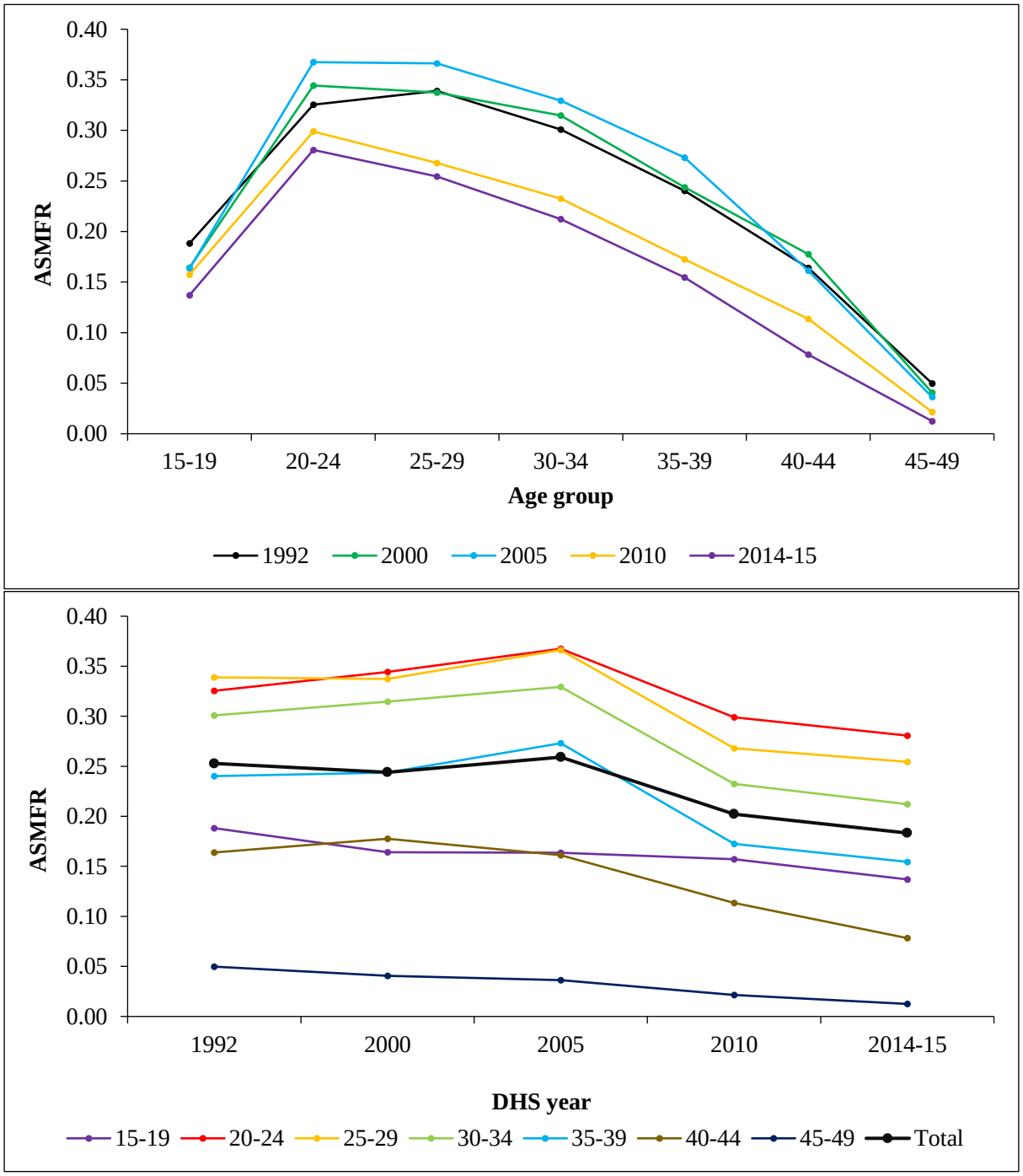


Figure 4.3: Temporal changes in the schedules of ASMFRs for Rwanda, DHS 1992-2014-15.

The sudden decline in ASMFRs which occurred between the 2005 and 2010 RDHS surveys was similar to the one observed on the onset of fertility transition during the first inter-survey period in the other three countries. The increase in ASMFRs for the period involving the first three RDHS surveys collected in 1992, 2000 and 2005, despite covering an extended period of 13 years, can be considered reminiscent of the temporary rise in birth rates that preceded fertility transition as observed in other countries. But this was not the case as reconstructed trends in TMFRs showed that the country had actually experienced a notable period of marital fertility decline in the late 1980s.

The general trajectory of trends in ASMFRs for Rwanda also showed deviations from those of the other countries. Unlike in the other countries, the first inter-survey period for Rwanda had the national average of ASMFRs appearing to have been influenced by the fertility rates of 15-19 and 25-29-year age groups. The RDHS1992-RDHS2000 inter-survey period was characterised by increased rates of marital fertility for 20-24, 30-34 and 35-3-year age groups. Meanwhile, rates for 15-19 and 25-29 had a downward bias with magnitudes similar to that of the national average (total). It may be that these two age groups influenced the slight downward change in the level of the mean ASMFRs in Rwanda. The increases in the fertility rates of the 15-19 and 25-29-year age groups in the second inter-survey period were also consistent with the pooled average for the country between the 2000 and 2005 RDHS surveys.

The 2002-2005 inter-survey period in Rwanda was characterised by increased rates of marital fertility for all age groups except those at the extremes of the age spectrum namely 15-19 and 40-44 and 45-49 years. The trends of ASMFRs for these age groups appear to have had little impact on the national average of ASMFRs in Rwanda particularly during the transitional

period which started after 2005. While predominantly younger age groups (20-24 and 25-29) were dominant in influencing the national trend in mean ASMFRs in Ghana, Kenya and Zimbabwe, Rwanda's case displayed a different scenario. Marital fertility in Rwanda appear to be mainly affected by childbearing occurring in the three middle age groups which are 20-25, 25-29 and 30-34. These three age groups consistently had markedly higher fertility rates than the national average with median rates occurring in the 35-39-year age group, one age group higher than the other three countries. The results imply that marital fertility in Rwanda continue to be high until the mid-30s unlike in Ghana, Kenya and Zimbabwe.

The quantum and tempo of fertility schedules for Zimbabwe bear similarities to an extent with those for Ghana and Kenya. Between the first two surveys of 1988 and 1993, there was a marked downward shift in ASMFRs for all age groups. This is signified by the notable gap between the graphs of ASMFR schedules of the first two surveys as shown in Figure 4.4 below. The pattern of temporal downward shift of ASMFRs continued into the second inter-survey period as reflected by the ZDHS1999 schedule of age-specific rates which was considerably lower than the preceding 1994 survey's. The downward shifts in the ASMFRs were consistent with the transitional period of rapid fertility decline in Zimbabwe which stretched from the mid-1980s to the mid-1990s as depicted in the reconstructed trends of TMFRs reported in Figure 4.8. After the 1999 ZDHS, there were no notable further gains in marital fertility transition. As shown in Figure 4.4, the fertility rates of most age groups were higher in the 2005-06, 2010-11 and 2015 ZDHS surveys compared to the levels that prevailed in the ZDHS1999. These results imply that the decline of marital fertility in real terms stopped in 1999. While the other three countries can be argued to be undergoing further marital fertility declines, this has not been the case for Zimbabwe where the latest ZDHS survey had a higher ASMFR schedule than that of the ZDHS1999.

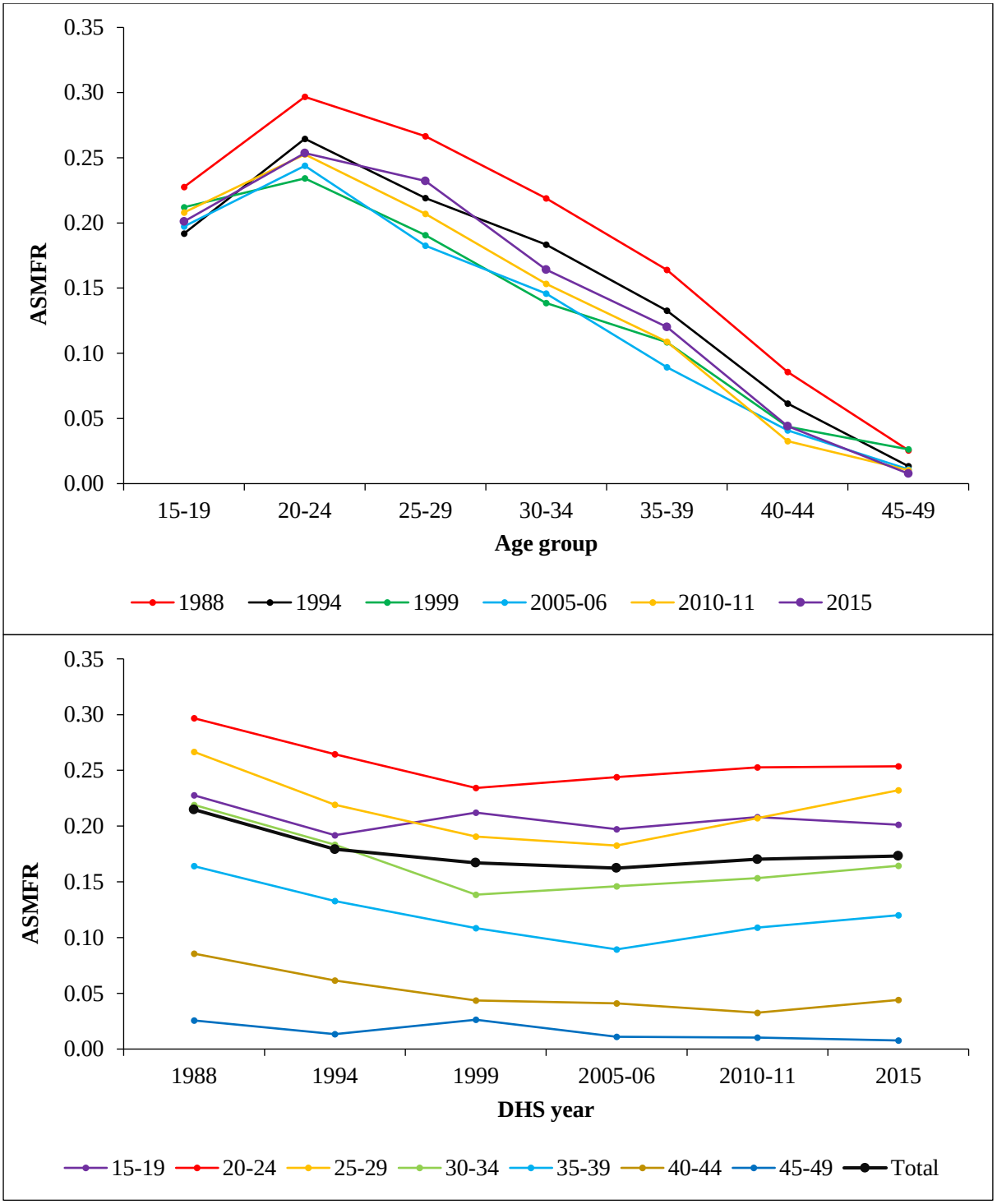


Figure 4.4: Temporal changes in the schedules of ASMFRs for Zimbabwe, DHS 1988-2015.

The trends in levels of ASMFRs for Zimbabwe reveal which age groups potentially influenced the national average characterised by falls and stalls of marital fertility rates between 1988 and 2015. Throughout the 1988-2015 period, the dominant age groups in terms of high fertility

rates relative to national average were 20-24 and 25-29 with the 15-19-year age group also showing dominance starting in the 1999 survey. The ASMFRs for Zimbabwe appear to be more related to those of Kenya in terms of age distributions of marital fertility. For instance, the median age group for the two countries was 30-34 years although in Zimbabwe this age group had notably lower fertility levels than the national average especially in the surveys collected from 1999 to 2015. Furthermore, the general trajectory of the timing and length of periods of rapid decline and stalling for Zimbabwe also differed from Kenya's. The inter-country differences in terms of timing of falling and stalling are explored in the next section.

4.3.2. Point estimates and reconstructed annual trends of fertility rates

The point estimates presented in this section are singulate summary measures of fertility rates from the respective surveys. These singulate measures were computed as averages of the three years preceding the year of survey. The survey specific point estimates provide a starting point for understanding temporal changes in marital fertility rates. The same graphs presenting point estimates of TMFRs also present the reconstructed annual fertility trends for the respective country. The trends were reconstructed to cover a period from 1982 to 2014 for Ghana, Kenya and Zimbabwe, and from 1985 to 2014 for Rwanda based on the available DHS surveys. The reconstructed trends provide a more detailed picture of the nature of the transitions. As highlighted in the methodology, the reconstructed annual trends were smoothed using three-yea moving averages resulting in the levels of marital fertility being lower compared than for point estimates. The trends of fertility rates are presented by country starting with Ghana in Figure 4.5 below.

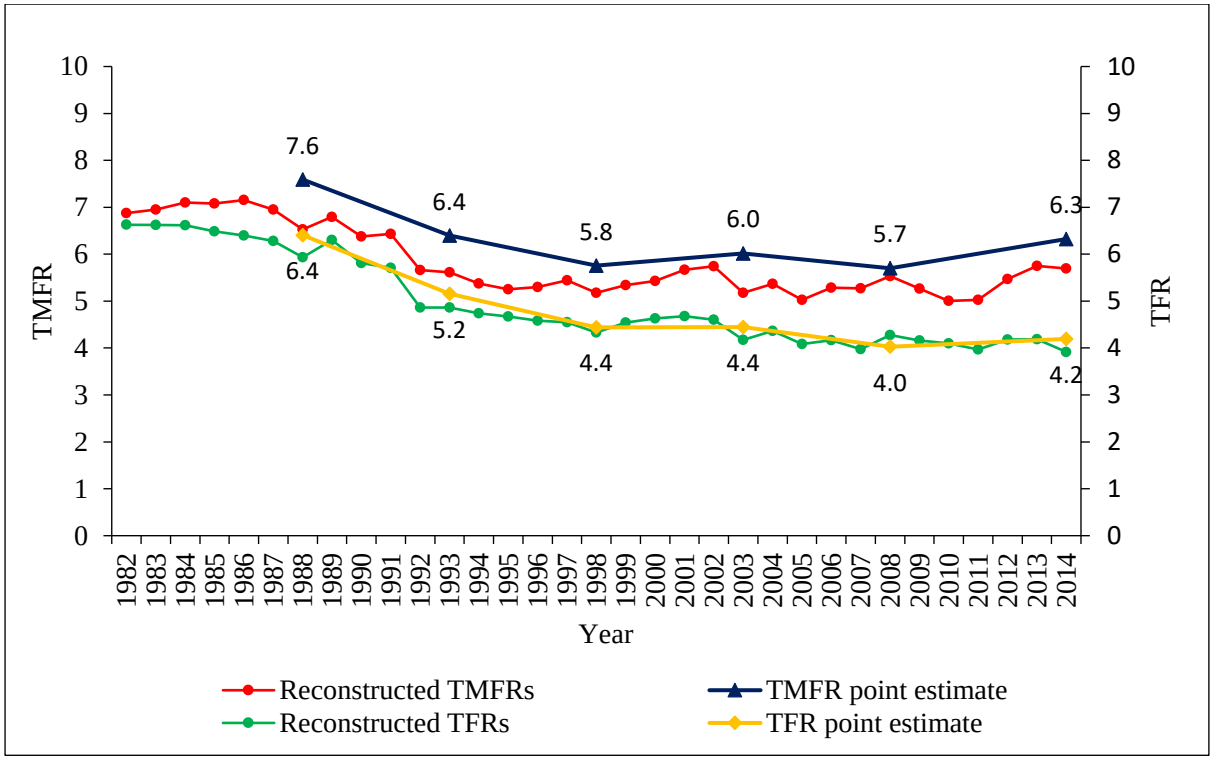


Figure 4.5: Trends in the fertility rates of Ghana from 1982 to 2014

The trends in the TFRs of Ghana show rapid declines between 1988 and 1999 which was followed by an inter-survey stall post 2000. The TMFR for the GDHS2014 at 6.3 births per woman was the same as that observed in the GDHS1993. This means that gains made during the 1984-2003 period have been eroded as current marital fertility rates have returned to the levels that prevailed at the early stages of the marital fertility transition. The trend of the reconstructed annual TMFRs of Ghana started with a four-year period of steady annual increase in marital fertility from 1982 to 1985 while TFRs were already declining. The ten-year period between 1985 and 1995 in Ghana was characterised by rapid decline in TMFRs with a similar trend occurring in TFRs. The post-1995 period was characterised by a widening gap between TMFRs and TFRs mainly due to the slower rate of transition and more pronounced stalling of marital fertility. The reconstructed fertility trends for Ghana presented in Figure 4.5 reveal better insights about fertility change in the country which would not be possible to observe using survey-specific point estimates. For instance, the results of the point estimates indicate

continuous decline of TMFRs from 1988 to 1998 but reconstructed trends reveal that the decline of Ghana's marital fertility stopped in the year 1995. The post-2002 period in Ghana saw TFRs declining but TMFRs fluctuating between 5.0 and 5.5 births for the 2003-2009 period and increasing annually from 2011 to 2014. These results imply that if the marital rates continue at high levels in Ghana, national fertility levels will likely remain high because of lack of sufficient declines in marital fertility especially if most of the majority of women spend most of their childbearing years in unions.

The TMFRs and TFRs for Kenya followed parallel trends throughout the entire period covered by DHS surveys [Figure 4.6 below].

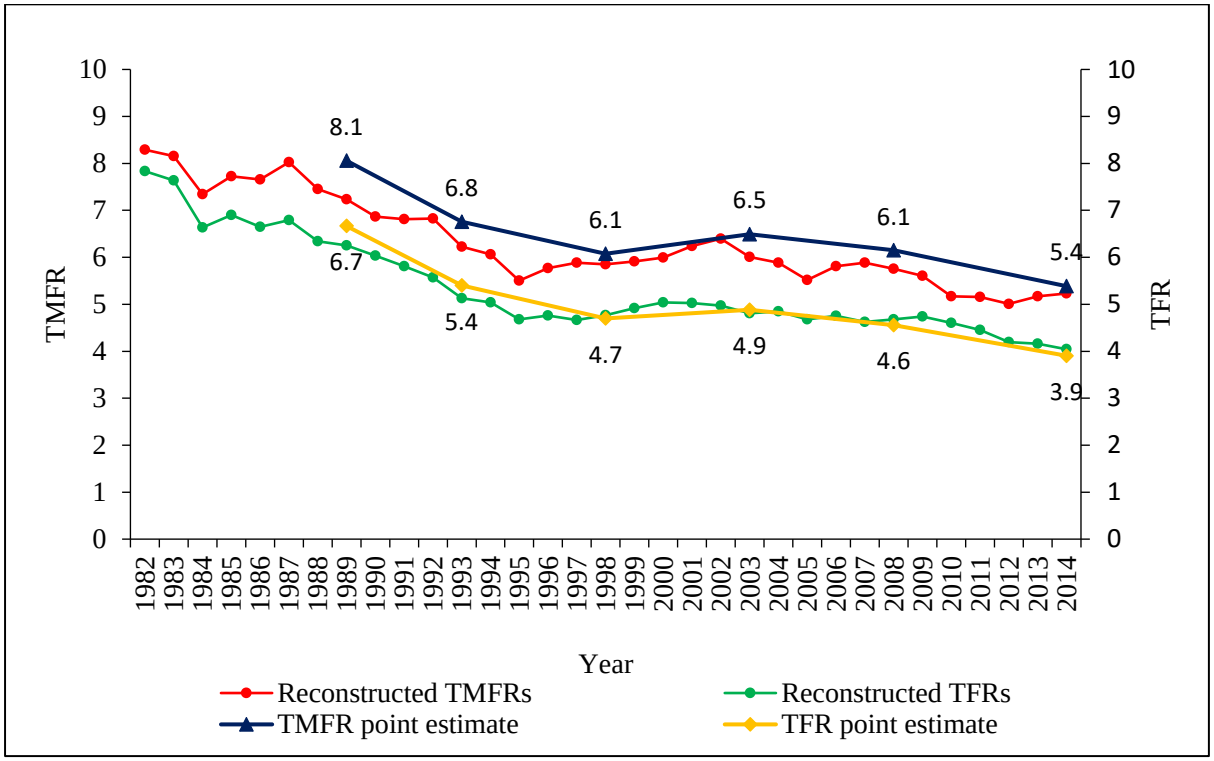


Figure 4.6: Trends in the fertility rates of Kenya from 1982-2014

There were rapid decreases in the point estimates of fertility rates involving the first KDHS surveys as well the 2008 and 2014 surveys. There was stall in the transition between the KDHS1998 and KDHS2003. The reconstructed trends show that the stall of marital fertility transition lasted for eight years in Kenya while TFRs stalled for only 5 years. During the stalling period, TMFRs showed a steeper rising slope compared to TFRs, increasing from 5.5 births in 1995 to a high of 6.4 births in 2003. A long-term decrease in marital fertility has prevailed since the end of the stall. The last three years covering 2012, 2013 and 2014 saw TMFRs appearing to increase. This may not necessarily imply that TMFRs have once again stopped falling because such periods of fertility appearing to increase have been experienced before in the country without qualifying as stalling. For instance, the 2005-2007 and 1984-1987 short periods were characterised by yearly increases in TMFRs but were merely fleeting occurrences in the long-term downward fertility trends. The future KDHS surveys will provide evidence to determine whether Kenya once again experienced stalling the post-2012 era.

The point estimates of fertility rates of Rwanda suggest a country starting off with rising high birth rates involving the country's first three surveys [Figure 4.7]. However, Rwanda's fertility transition started in the second half of the 1980s decade with marital fertility rates declining annually for ten years between 1986 and 1995. During this period, TMFRs decreased from above nine births to 7.4 in 1995. In just four years between 1986 and 1990, Rwanda's TMFRs decreased by 14 percentage points.

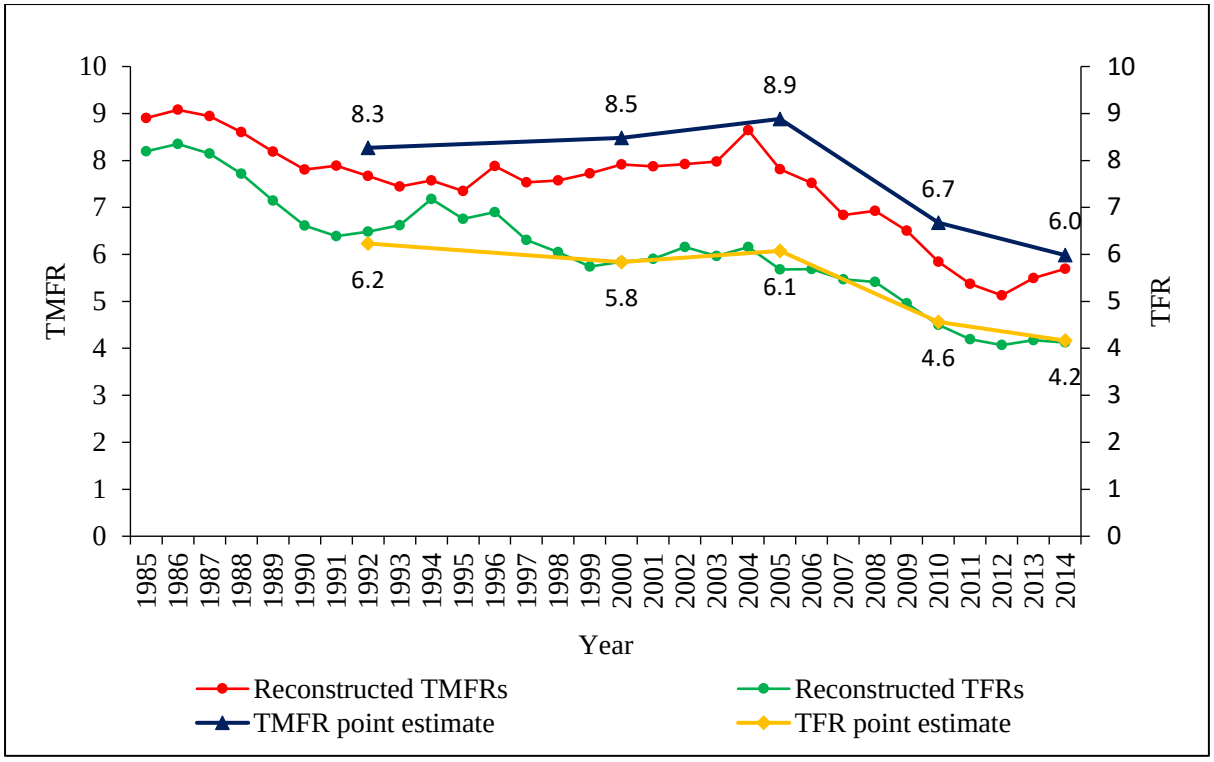


Figure 4.7: Trends in the fertility rates of Rwanda from 1985 to 2014

The decline in TMFRs in Rwanda which lasted close to ten years was followed by a period of similar duration which was characterised by annual increases in marital fertility rates. This period of apparent stalling of TMFR transition lasted from 1995 to 2004 when it reached a peak of 8.7 births per woman. The end of stalled TMFR transition saw a remarkably rapid downward change in marital fertility which lasted for eight years, stretching from 2004 to 2012. During this eight-year period, TMFRs fell by 41% having fallen from 8.7 in 2004 to 5.1 in 2012. The TMFR of 5.1 was the lowest in the history of Rwanda and results reported in Figure 4.7 indicate that post 2012 years had higher rates. The trend for TFRs in Rwanda followed similar behaviour as that for TMFR but at lower levels and with less defined fluctuations, potentially reflecting the smoothing effect of those who were not in unions.

The fertility transition of Zimbabwe started slightly earlier than those of the other three countries. The onset of fertility transition started in the early 1980s although there was a time lag with respect to TMFRs which began to decline in 1985 [Figure 4.8 below].

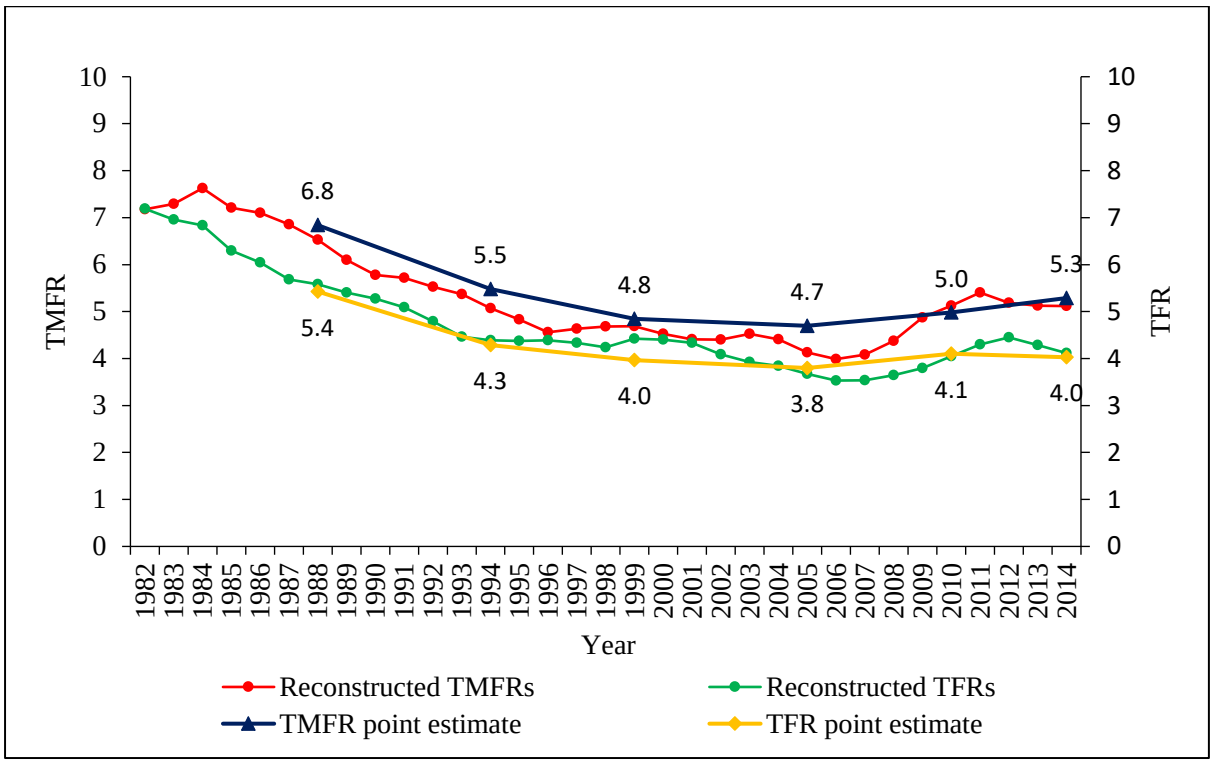


Figure 4.8: Trends in the fertility rates of Zimbabwe from 1982 to 2014

There was a rapid decline in marital fertility rates between 1984 and 1996 where TMFRs fell by 40% in a 12-year period. The phase of rapid marital fertility decline in Zimbabwe was followed by one characterised by slow downward change in TMFRs which stretched from 1996 to 2006. There was a rebound in TMFRs annually from 2007 to 2011 as TMFRs rose by a full birth from 4.2 (2006) to 5.4 (2011) which signalled a return to the marital fertility levels of the early 1990s. The fertility trends for Zimbabwe appeared to converge for much of the1985-2001 period due to the faster decline of TMFRs compared to TFRs. However, there has been a widening gap between TMFRs and TFRs influenced by the former's higher rate of increase on an annual basis in the post-2001 era.

On the overall picture of the history of the transitions, an interesting observation can be made from the trends of fertility rates for Zimbabwe. There have arguably been two instances of stalling of the TFR transition, the 1994-2000 and 2006-2012 periods. The first instance of these stalls took the form of lack of change in the levels of TFRs while the second was characterised by increases in fertility. Meanwhile, the transition of TMFRs has only stalled once between 2006 and 2007.

4.3.3. Marital fertility transitions; falling, reversals and resumptions

It has already been established in the preceding section that the transitions of TMFRs have not been continuous. Furthermore, the transitions of the TMFRs of Ghana, Kenya, Rwanda and Zimbabwe have not been the same across the countries. Each country has experienced distinct identifiable periods of change trajectories since the onset of marital fertility transition. This section explores the nature of these trajectories of transitions of marital fertility as experienced in each country. It presents the statistical significance of the slopes of the trends for each country and identifies the distinct time frames that define the temporal features of the transitions. The analysis was conducted based on reconstructed trends of TMFRs reported in section 5.3. There were six different distinct periods identified across the four countries. These were onset rapid decline, slow decline, no change, reversal, resumption with fast decline and resumption with slow decline. In interpreting the results from tests of slopes reported in this section, it is noteworthy that period 1-4 do not refer to the same timeframes in terms of years across the countries although there were instances of similarities [Table 4.5].

Table 4.5: Identifiable distinct periods in the fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe, DHS data

	Period 1	Period 2	Period 3	Period 4	Total
Ghana	1986-1995	1995-2003	2003-2014		**1986-2014**
Kenya	1987-1995	1995-2002	2002-2014		**1987-1995**

Rwanda	1986-1993	1993-2004	2004-2014		**1986-2014**
Zimbabwe	1984-1996	1996-2006	2006-2011	2011-2014	**1984-1996**

The results from the statistical tests of the slopes are reported in Table 4.6 below. The statistical significance of the slope coefficients in Table 4.6 can be established based on the 95% confidence interval. When both lower and upper bounds of the confidence interval have negative or positive sign, it means that the slope coefficient was significantly different from zero. The coefficients can be converted and interpreted as percentages that reflect the rate of decrease or increase in a birth on an annual basis. For instance, a time coefficient of 0.147 for Ghana between 1982 and 1995 implies that there was an annual reduction in the nth birth (child) by 15%. Thus, it would take seven years for the TMFR of Ghana to decrease by one full birth from 6.9 births in 1982 to 5.9 births in 1989 through an annual rate of 15% reduction in the nth birth.

In three of the countries namely Ghana, Kenya and Rwanda, there have so far been three periods that can be identified over the period covered by DHS data. Only Zimbabwe was found to have had a fourth distinct period. The first period which signified the onset of fertility transition for all the countries was characterised by rapid decline in marital fertility rates. This period is indicated by the orange cells in Table 4.6. All the four countries experienced this period although with varying time coefficients. The time coefficients measure the slope of the trends whereby steeper slopes were reflected in coefficients that were furthest from zero. The steepest decline during the onset rapid decline period was experienced in Zimbabwe which had a slope coefficient of -0.218 followed by Rwanda (-0.186) and Kenya (-0.184) with Ghana (-0.147) having the least. Nonetheless, all the countries had statistically significant declines of TMFRs when they first experienced fertility transition. By the end of the onset rapid decline

period, Ghana's TMFR had fallen by 24% while those of Kenya, Rwanda and Zimbabwe fell by 34%, 17% and 37% respectively.

Table 4.6: Statistical significance of the falls and stalls of the TMFRs for Ghana, Kenya, Rwanda and Zimbabwe, DHS data

			Period 1	Period 2	Period 3	Period 4	Total
Ghana	TMFR	Start	7.2	5.3	5.7		**7.2**
		End	5.3	5.7	5.7		**5.7**
		% change	-26.4	9.3	-0.8		**-20.8**
	Slope test	Time Coef	-0.218	0.064	0.013		**-0.048**
		95% CI	-0.267; -0.170	0.015; 0.113	-0.031; 0.058		**-0.068; -0.027**
Kenya	TMFR	Start	8.0	5.5	6.4		**8.0**
		End	5.5	6.4	5.2		**5.2**
		% change	-31.3	16.2	-18.2		**-35.0**
	Slope test	Time Coef	-0.272	0.107	-0.095		**-0.089**
		95% CI	-0.328; -0.216	0.073; 0.142	-0.128; -0.063		**-0.104; -0.074**
Rwanda	TMFR	Start	8.9	7.4	8.6		**8.9**
		End	7.4	8.6	5.7		**5.7**
		% change	-16.9	17.6	-34.2		**-36.0**
	Slope test	Time Coef	-0.196	0.093	-0.320		**-0.099**
		95% CI	-0.246; -0.146	0.037; 0.149	-0.412; -0.229		**-0.126; 0.072**
Zimbabwe	TMFR	Start	7.6	4.6	4.0	5.4	**7.6**
		End	4.6	4.0	5.4	5.1	**5.1**
		% change	-39.5	-12.5	35.5	-5.2	**-32.9**
	Slope test	Time Coef	-0.249	-0.055	0.306	-0.091	**-0.075**
		95% CI	-0.267; -0.230	-0.083; -0.028	0.237; 0.374	-0.239; 0.058	**-0.104; -0.046**

Key

Onset, rapid decline	Reversal
Slow decline	Resumption, slow decline
No change	Resumption, fast decline

The reversals experienced in Ghana, Kenya and Rwanda in period 2 have been described as stalling in demographic literature. The highest annual increase during the reversal period was experienced in Kenya which had a slope coefficient of 0.107 followed by Rwanda (beta=0.093) while Ghana had a beta of 0.061. Following a period of rapid decline that signified the onset of marital fertility transition, Ghana, Kenya and Rwanda entered a period of reversals of the gains towards low fertility that had been accrued between 1982 and 1995. The reversals were

statistically significant at 95% confidence interval. This means that TMFRs for these three countries significantly increased after the end of rapid falls in marital fertility observed in the first period. Meanwhile, period 2 for Zimbabwe was characterised by slow decline in marital fertility rates but still represented significant declines. This period stretched from 1996 to 2006. The magnitude of decline over the ten-year period was statistically significant (slope coef -0.055: 95% CI -0.083; -0.023).

In the third identifiable period, Kenya and Rwanda returned to rapid decline in TMFRs. For Rwanda (2004-2014) the resumption period was characterised by even faster annual rate of decline (slope coef -0.320; 95% CI -0.412; -0.229) in marital fertility that the rate experienced following the onset of marital fertility transition. In period 3 for Kenya which stretched from 2002 to 2014, the resumption of marital fertility transition was not characterised by as fast decline as in the first period although it signified a return to significant declines in marital fertility. Meanwhile, the third identifiable period in the history of marital fertility transition in Ghana was marked by constant fertility rates. As shown in Table 5.2, the slope coefficient for period 3 in Ghana (slope coef 0.013; 95% CI -0.031; 0.058) implied no significant change in the TMFRs of the country over the 2003-2014 timeframe. In the case of Zimbabwe, the third distinct period of marital fertility transition which occurred between 2006 and 2011 was characterised by stalling. By the end of this period, Zimbabwe's TMFR had increased by 31% and can be regarded as reflecting the first instance of national-level stalling on marital fertility transition in the country.

Since the onset of marital fertility transition, there has only been three identifiable phases in Ghana, Kenya and Rwanda; Zimbabwe is the only country that can be argued to have had a

fourth identifiable period. This fourth period which covers the post-2011 era, marked the resumption of declines in marital fertility rates. Whether this period of resumption characterised by slow decline will lead to replacement level fertility will be open for evaluation as new data become available.

The tests of the overall decline in the marital fertility rates of Ghana, Kenya, Rwanda and Zimbabwe showed that all the countries have experienced significant transitions. Although marital fertility rates remain high in these countries, the results provided evidence to suggest that marital fertility has significantly declined from the pre-1990 levels.

4.4. Summary of the chapter

This chapter described the sample distribution for the study by all the independent variables sorted by country. The proximate determinants especially prevalence of modern contraceptive use increased over time in all the countries although to different degrees. For all the countries, the education status of women and their husbands improved over time with husbands being shown to generally have greater educational attainment than the women. The demographic properties of the sample showed significant temporal changes in the four countries especially infant and child mortality. There were differences in the levels of these under-5 mortality rates across the countries. The conclusion for this chapter is that the married populations for Ghana, Kenya, Rwanda and Zimbabwe have undergone significant temporal compositional changes over the three decades covered by DHS surveys. The use of modern contraceptives, educational attainment and levels of employment have increased in the four countries.

The analysis of the trends in TMFRs of Ghana, Kenya, Rwanda and Zimbabwe has shown that the countries have experienced varying trajectories towards low marital fertility. While all the countries experienced fast declines following the onset of fertility transition, this period lasted longest in Zimbabwe followed by Ghana and shortest in Rwanda. The timing and duration of subsequent change trajectories and their magnitudes in the form of reversals, slow declines and resumptions have an important bearing on each country's prospect of reaching desirable replacement-level TMFRs. The time it will take to achieve low fertility rates based on past contexts of change will arguably depend on the composition of populations and their preferences with respect to family size. An understanding of the factors that determine fertility rates provides a platform for evaluating why countries have had differences in the levels of marital fertility at each time period. While this chapter has shown changes in marital fertility rates over time, it falls short of providing an explanatory base for understanding the factors that gave rise to observed levels of fertility. This platform for appraising TMFRs is presented in the next chapter.

CHAPTER 5 : DETERMINANTS OF MARITAL FERTILITY RATES

5.1. Introduction

Among other objectives, this research sought to investigate the determinants of marital fertility rates and differentials which was addressed through estimating adjusted effects of proximate and background factors using multivariate random effects linear regression models. The specific purpose of this objective was to establish the extent to which proximate factors, male and female variables as well as other background factors explain the marital fertility rates of Ghana, Kenya, Rwanda and Zimbabwe. This chapter presents the findings from the multilevel regression analysis conducted on each of the DHS surveys from the four countries. Although the results for each dataset were obtained from one multivariate model, the chapter presents them according to the class of determinants. Consequently, section 5.2 of the chapter looks at the adjusted effects of proximate determinants, assuming a temporal inclination in the interpretation of how this class of factors related to fertility rates. The second part of the chapter presents results on female variables, continuing with the same interpretive structure used in section 5.2. The third section of the chapter looks at male variables and the last section focuses on social and geographic variables.

5.2. Multilevel parameters and constants

Before delving into the specific results of the determinants of marital fertility, it is worth commenting on the random effects parameters obtained from the multilevel models. Table 5.1 below presents the multilevel parameters for each of the models explored. Given that the sections 5.3 to 5.7 are organised in terms of types of independent variables, there is no room for the intercept, that is, the regression constant. This is therefore included in Table 5.1 below

together with results of multilevel parameters. Due to the many decimal places of the estimates, the coefficients and confidence intervals are presented in scientific notation.

Table 5.1: Multilevel parameters and the constants

Ghana	**1988**			**1993**			**1998**			**2003**			**2008**			**2014**		
	Coefficient	95% CI		Coefficient	95% CI		Coefficient	95% CI		Coefficient	95% CI		Coefficient	95% CI		Coefficient	95% CI	
Constant	2.59E-01	2.42E-01	2.76E-01	2.67E-01	2.52E-01	2.82E-01	2.31E-01	2.17E-01	2.46E-01	2.29E-01	2.10E-01	2.48E-01	2.36E-01	2.23E-01	2.49E-01	2.85E-01	2.71E-01	3.00E-01
Random effects	9.20E-07	2.21E-12	1.84E-06	9.31E-07	3.18E-19	1.86E-06	1.19E-05	3.17E-06	4.50E-05	1.67E-05	4.85E-06	5.74E-05	4.38E-06	4.61E-07	4.15E-05	1.27E-05	5.44E-06	2.94E-05
Residual	1.17E-03	1.12E-03	1.22E-03	5.50E-04	4.91E-04	6.17E-04	4.81E-04	4.53E-04	5.12E-04	9.25E-04	8.63E-04	9.91E-04	3.28E-04	3.07E-04	3.51E-04	8.45E-04	8.02E-04	8.91E-04
Kenya	**1989**			**1993**			**1998**			**2003**			**2008**			**2014**		
	Coefficient	95% CI		Coefficient	95% CI		Coefficient	95% CI		Coefficient	95% CI		Coefficient	95% CI		Coefficient	95% CI	
Constant	3.25E-01	3.17E-01	3.34E-01	2.77E-01	2.62E-01	2.93E-01	2.97E-01	2.86E-01	3.08E-01	2.75E-01	2.60E-01	2.90E-01	2.78E-01	2.68E-01	2.89E-01	2.71E-01	2.64E-01	2.77E-01
Random effects	7.47E-18	8.59E-37	1.49E-17	3.85E-06	2.70E-09	5.49E-03	9.96E-06	3.44E-06	2.89E-05	7.00E-12	4.68E-39	1.40E-11	2.60E-05	1.76E-05	3.84E-05	1.53E-05	1.16E-05	2.02E-05
Residual	7.25E-04	6.52E-04	8.07E-04	7.18E-04	6.55E-04	7.86E-04	6.64E-04	6.02E-04	7.32E-04	5.98E-04	4.95E-04	7.24E-04	5.17E-04	4.92E-04	5.43E-04	2.26E-04	2.12E-04	2.40E-04
Rwanda				**1992**			**2000**			**2005**			**2010**			**2015**		
				Coefficient	95% CI		Coefficient	95% CI		Coefficient	95% CI		Coefficient	95% CI		Coefficient	95% CI	
Constant				2.49E-01	2.22E-01	2.77E-01	1.95E-01	1.39E-01	2.51E-01	2.69E-01	2.36E-01	3.02E-01	2.53E-01	2.41E-01	2.66E-01	2.28E-01	2.14E-01	2.42E-01
Random effects				2.89E-06	5.71E-09	1.46E-03	6.50E-06	1.39E-07	3.04E-04	1.85E-05	3.54E-06	9.66E-05	2.75E-12	1.51E-14	5.00E-10	3.12E-06	3.04E-07	3.20E-05
Residual				8.40E-04	7.94E-04	8.89E-04	1.05E-03	9.80E-04	1.13E-03	1.01E-03	9.64E-04	1.06E-03	4.44E-04	4.24E-04	4.65E-04	4.84E-04	4.67E-04	5.02E-04
Zimbabwe	**1988**			**1994**			**1999**			**2005-06**			**2010-11**			**2015**		
	Coefficient	95% CI		Coefficient	95% CI		Coefficient	95% CI		Coefficient	95% CI		Coefficient	95% CI		Coefficient	95% CI	
Constant	2.60E-01	2.46E-01	2.75E-01	2.35E-01	2.20E-01	2.50E-01	2.62E-01	2.51E-01	2.74E-01	2.31E-01	2.21E-01	2.42E-01	2.53E-01	2.43E-01	2.63E-01	2.53E-01	2.41E-01	2.64E-01
Random effects	2.74E-17	2.25E-57	5.48E-17	2.13E-06	2.89E-08	1.56E-04	2.91E-07	1.62E-23	5.82E-07	9.87E-06	5.30E-06	1.84E-05	9.08E-06	3.30E-06	2.50E-05	9.14E-06	4.78E-06	1.75E-05
Residual	8.81E-04	8.27E-04	9.39E-04	8.40E-04	7.73E-04	9.13E-04	5.19E-04	4.59E-04	5.87E-04	4.07E-04	3.58E-04	4.63E-04	7.74E-04	7.15E-04	8.37E-04	4.75E-04	4.20E-04	5.36E-04

As shown in Table 5.1 above, the random effects parameters were statistically significant in all the 23 multilevel models explored. This signifies that there were cluster-related variabilities in the effects of some of the proximate and background variables on marital fertility. In other words, the fertility outcomes of the individual women were associated with the cluster (community) they were residing when analysed in terms of at least one of the independent variables. The residual represents the estimated variance associated with the overall error term. As shown in the Table above, the residual terms were mostly fairly small although they were significantly different from zero. This implies that the models were sufficiently inclusive of the relevant factors needed for understanding the cross-sectional differences in marital fertility rates.

5.3. Proximate determinants and marital fertility; time-mediated relationships

This section explores how each proximate factor was associated with the individual-level fertility rates in each of the DHS surveys from Ghana, Kenya, Rwanda and Zimbabwe. The proximate determinants that were analysed are contraceptive use, average duration of postpartum infecundity and age at first union. The results on proximate determinants are presented in Figures 5.1 to 5.4 below following the alphabetic order of the four countries studied. The results reported in Figures 5.1 to 5.4 show the importance of proximate determinants in explaining differences in marital fertility. Instances of significant coefficients Figures 5.1-5.4 are represented by striped bars.

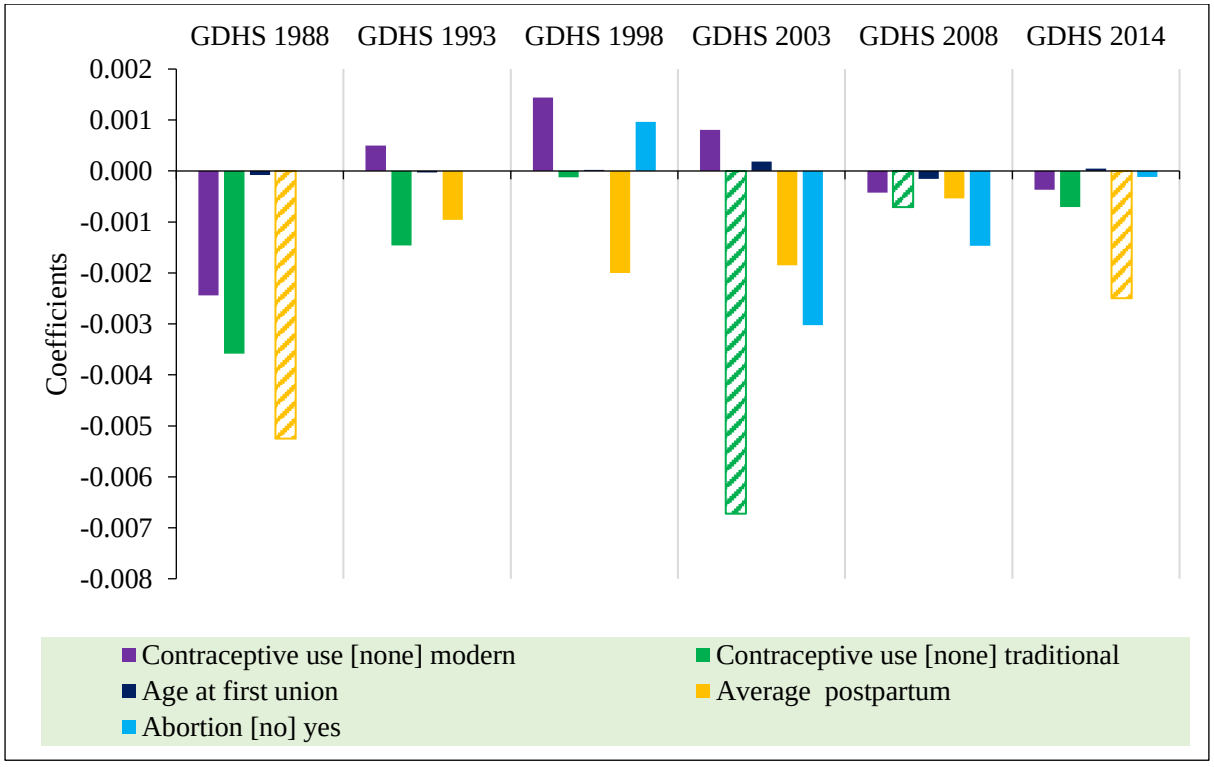


Figure 5.1: Effects of proximate determinants on marital fertility rates in Ghana, DHS 1988-2014

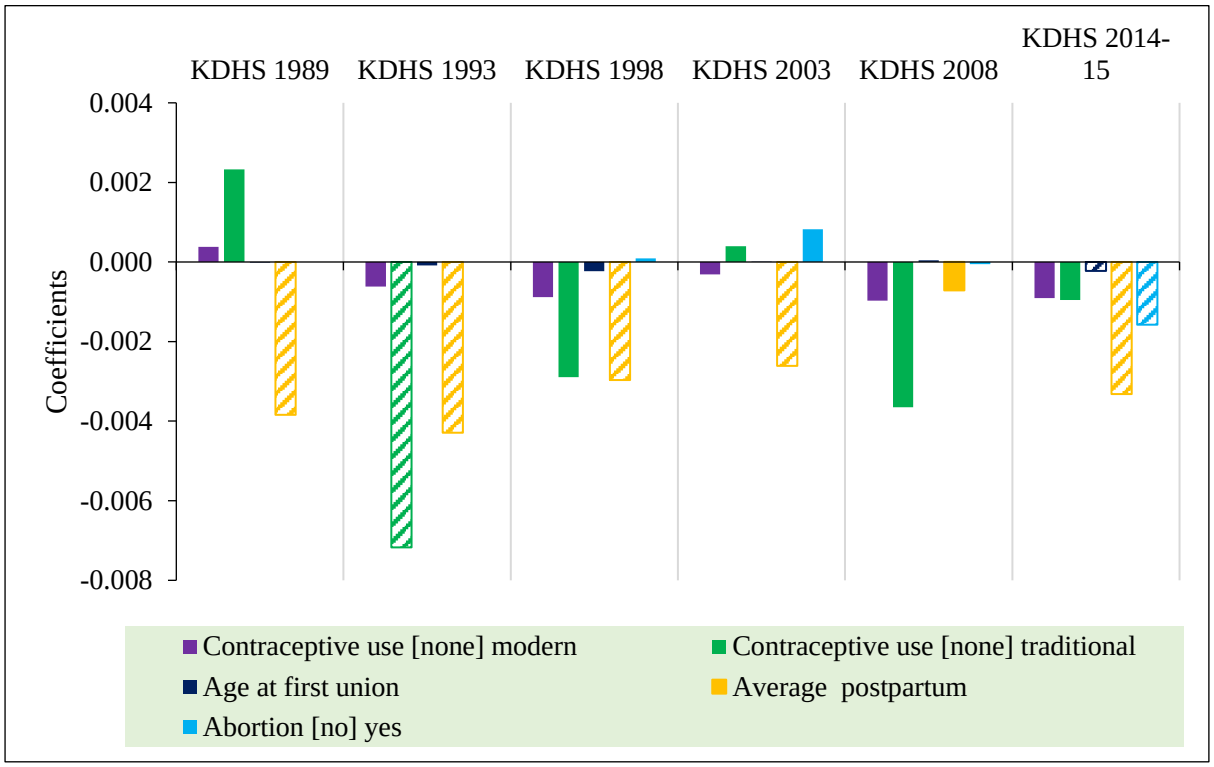


Figure 5.2: Effects of proximate determinants on marital fertility rates in Kenya, DHS 1989-2014/15

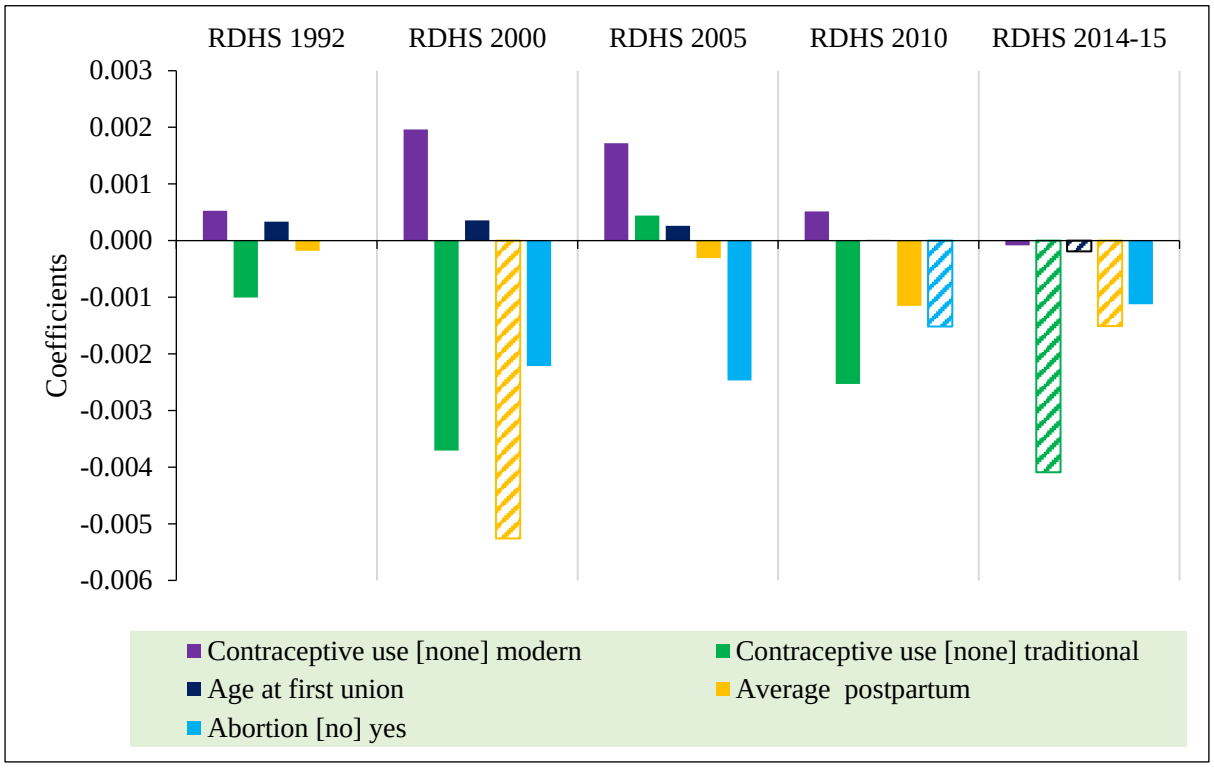


Figure 5.3: Effects of proximate determinants on marital fertility rates in Rwanda, RDHS 1992-2014/15

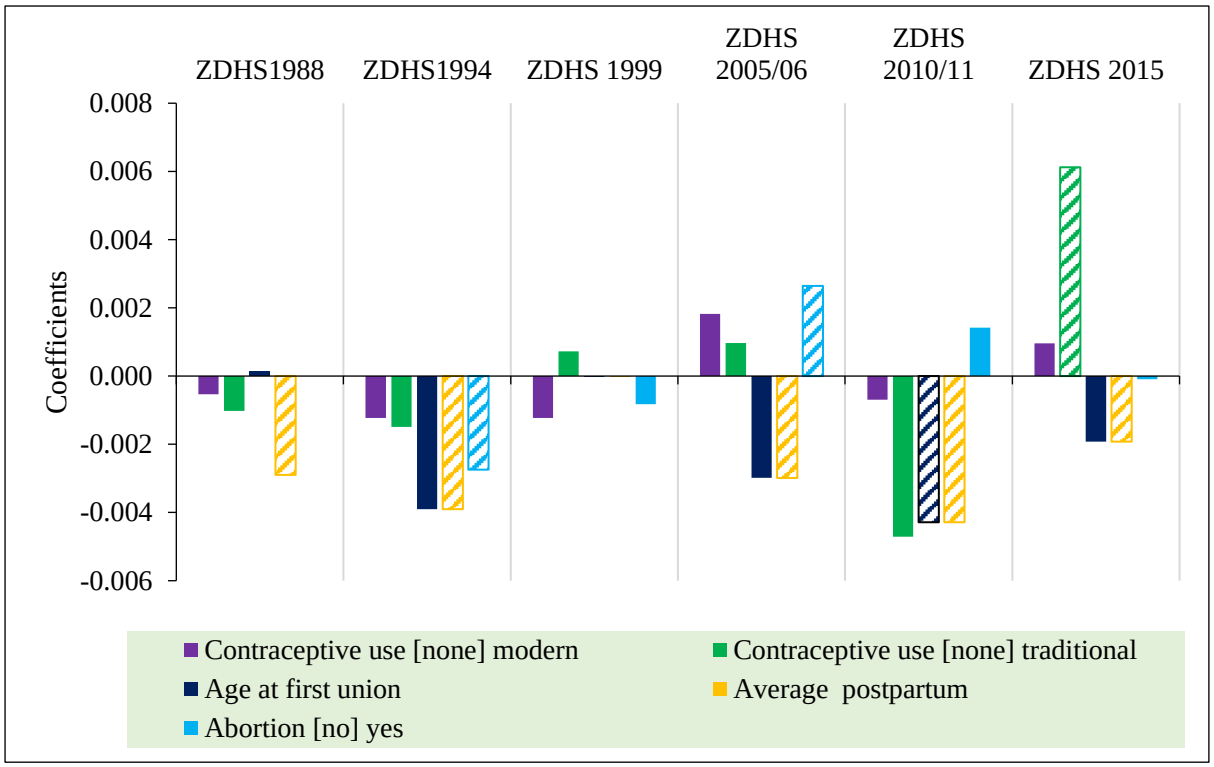


Figure 5.4: Effects of proximate determinants on marital fertility rates in Zimbabwe, ZDHS1988-2015

The results in Figures 5.1 and 5.4 show that contraceptive use and average duration of postpartum infecundity had significant adverse effects on mean ASMFRs in the 1989 and 1988 surveys from Ghana and Zimbabwe respectively. The results on contraceptive use in these two countries imply that the average ASMFRs of users of modern or traditional contraceptives were significantly less compared to non-users of contraception. The average duration of postpartum infecundity was derived at the cluster level. The interpretation of the results for this variable therefore is that living in communities with longer durations of breastfeeding and abstinence in Ghana and Zimbabwe pre-1990 significantly reduced the mean ASMFRs compared to residing in communities with shorter durations of postpartum infecundity. The age at first union also affected mean ASMFRs with statistical significance in the first ZDHS survey but not in the other three countries. Delay in initiating marital life significantly reduced the fertility of married women in Zimbabwe. There was also a negative association between age at first union and level of mean ASMFRs in Ghana and Kenya, but magnitudes of the associations were statistically negligible.

The results from surveys conducted between the years 1990 and 1998 reveal that none of the proximate determinants had statistically significant impact on the average rates of marital fertility in Ghana. This represented a weakening of the importance of proximate determinants in explaining differentials in marital fertility. Where significant effects of proximate factors were observed namely in Kenya, Rwanda and Zimbabwe, the implications of the findings differed across the countries. The results for the KDHS1993 and ZDHS1994 showed that using traditional or modern contraceptives was associated significant reductions in fertility. Meanwhile, the results from the RDHS1992 revealed that the use of modern contraceptives was associated in increase in marital fertility. This finding potentially points at use of contraceptives as a tool for birth spacing by younger women and not necessarily stopping while

users of traditional methods may be motivated by the need to end childbearing. The age at first union, although statistically insignificant, had an adverse association with marital fertility in the ZDHS1994. The effect of living in communities with longer durations of postpartum infecundity continued to significantly affect fertility rates in Kenya and Zimbabwe in the second round of DHS surveys.

The surveys collected in the 1995-2000 period revealed the changing cross-sectional associations between proximate determinants and mean AMFRs in Ghana, Kenya, Rwanda and Zimbabwe. The only significant proximate determinant was average length of postpartum period in Kenya (KDHS1998) and Rwanda (RDHS2000). The 2001-2005 surveys further confirmed the constant changing relationships between proximate factors and differentials in fertility rates in the four countries. The results for Zimbabwe (ZDHS2005-06) showed that the use of modern contraceptives was associated with increase in marital fertility compared to non-use of contraceptives. This represented a departure from the negative modern contraceptives-fertility relationships that observed in the three previous surveys. The seemingly counter-intuitive positive association between the use of modern contraceptives and fertility may be due to that contraception may not be associated with desire to limit childbearing but to space births. Furthermore, this may simply reflect the age distribution of modern contraceptive use whereby women below 30 years, which is the age group of peak marital fertility, report higher prevalence of contraceptive use.

The results from the surveys whose reference period was 2006-2010 showed that proximate factors were not significantly associated with marital fertility rates in Ghana and Kenya. Nonetheless, as shown in Figures 5.1 and 5.2, the presence of a proximate factor appeared to

have an adverse effect on average ASMFRs in the two countries with the exception of age at first union in Kenya. In the RDHS2010, women who reported to have had an abortion had significantly lower fertility rates than those who had never had an abortion. The other proximate factors that were adversely associated with fertility rates in the RDHS2010 were community-level average duration of postpartum infecundity and the use of traditional methods of contraception although without statistical significance at the 5% level.

The effect of delayed age at first union was significant in the ZDHS2010-11 where it notably reduced marital fertility rates. The ZDHS2010-11 also showed negative associations between contraceptive use and fertility, but the relationships lacked statistical significance. With respect to abortion, the results from the ZDHS2010-11 indicate that this proximate determinant was positively associated with fertility while the increase in the duration of postpartum infecundity was negatively associated with fertility with statistical significance. Abortion can be positively associated with fertility in instances where those who report to have aborted were predominantly non-users of contraceptives while those who never aborted used contraceptives effectively. Furthermore, the age distribution of abortion may be biased towards younger age groups where marital fertility is concentrated compared to older age cohorts the majority of whom have stopped childbearing.

The last surveys collected in Ghana, Kenya, Rwanda and Zimbabwe were all collected in 2014 and 2015 and these can be used to infer the current status of the associations between proximate determinants and marital fertility in the four countries. The results from these surveys show that there were different implications of proximate factors on marital fertility across the countries. In Ghana, postpartum infecundity was the only proximate factor which was

significant in reducing marital fertility rates at the 95% confidence level. Despite lacking statistical significance, the presence of contraceptive use, delayed age at first union and having ever aborted were negatively associated with marital fertility rates in the GDHS2014. These results for Ghana were related to those for Kenya where abortion, postpartum infecundity and age at first union were associated with reductions in fertility rates but with statistical significance. The KDHS2014-15 showed a similar type of relationship between proximate determinants and marital as that observed in the KDHS2008. The statistically significant result for postpartum infecundity in the KDHS2014-15 confirmed the primacy of the claim that community-level fertility-inhibiting behavioural characteristics can influence individual-level fertility outcomes. The results from the KDHS2014-15 were the first instance in Kenya where statistical evidence showed that women who reported that they have had an abortion had significantly reduced fertility compared to those who had never aborted.

In the last survey collected in Rwanda (RDHS2014-15), all the proximate determinants were negatively associated with marital fertility rates. Significant associations involved delayed age at first union and average duration of postpartum infecundity. The results from the RDHS2014-15 signified an increase in the strengths of the fertility inhibiting effects of proximate determinants given that it was only abortion which had a statistically significant association with fertility in the preceding RDHS2008. The results from the 2014-15 Kenyan and Rwandan surveys contrasted with those from the ZDHS2015. Unlike in Kenya and Rwanda, the use of contraception particularly traditional methods in Zimbabwe was associated with increased fertility rates compared to non-use of contraception. The positive association between contraception and fertility in the ZDHS2015 was in contrast with the relationship observed in the preceding ZDHS2010-11 survey. This signifies that the association between marital fertility

and contraception has not been stable in Zimbabwe, it constantly changed over time jus like in the other countries.

To conclude this section, important observations were made regarding the role of proximate determinants on fertility levels and differentials in Ghana, Kenya, Rwanda and Zimbabwe. In the countries that have undergone considerable marital fertility transition namely Kenya and Zimbabwe, the most consistent proximate determinant of reductions in marital fertility was the community-level average duration of postpartum infecundity. In Ghana and Rwanda, the two countries with limited fertility transitions, role of proximate determinants in explaining mean levels of ASMFRs and differentials were relatively subdued.

5.4. Adjusted effects of female variables on marital fertility: A temporal analogy

The results reported in this section show that female background variables were largely insignificant predictors of differentials in the marital fertility rates of women from Ghana, Kenya, Rwanda and Zimbabwe. Nonetheless, the results from the four countries reveal insightful evidence regarding the potential roles of female characteristics on marital fertility in the patriarchal context of SSA. The results for Ghana reported in Figure 5.5 below show that education was significant in explaining differences in marital fertility in the GDHS1988 only. In this GDHS1988 survey, women with tertiary education had significantly reduced fertility rates compared to those who did not have any education. There was also statistically significant evidence proving the fertility inhibiting effects of employment in the 1988 and 2008 GDHS surveys. The results from the GDHS1988 and GDHS2008 showed that relative to not being employed, unskilled employment was associated with significant reduction in fertility.

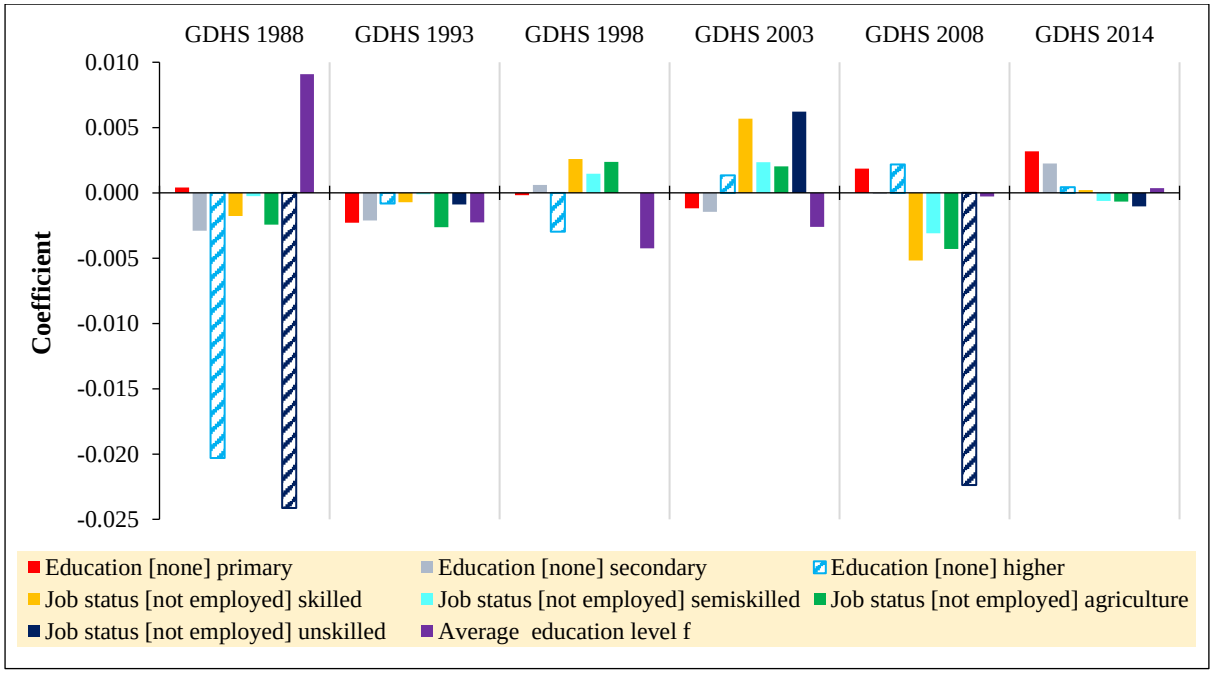


Figure 5.5: Effects of female variables on marital fertility in Ghana, DHS 1988-2014

It can be observed in Figure 5.5 that the impact of education and employment status variables of women on differentials in marital fertility rates were more subdued in the 1993 and 2014 GDHS surveys compared to the other surveys. When perceived in the light of the TMFR trends presented in Chapter 5, it can be noted that the periods covered by these surveys were characterised by lack of decline in the fertility rates of married women. It can therefore be deduced that stalling and reversal periods result from diminished benefits of socioeconomic development. The community-level average of education was negatively associated with fertility rates in all the GDHS surveys except those collected in 1988 and 2014 although the association was not statistically significant at the 95% level of confidence.

Looking at the Kenyan surveys, individual-level education and employment status were not significant explanatory factors of fertility differentials among married women in all the KDHS surveys collected in the country. Nonetheless, it is worth pointing out that primary and

secondary education attainment appeared to be positively associated with marital fertility rates in most of the KDHS surveys. As shown in Figure 5.6 below, it was only in the KDHS2008 that attainment of primary and secondary education was associated with the reduction of marital fertility rates.

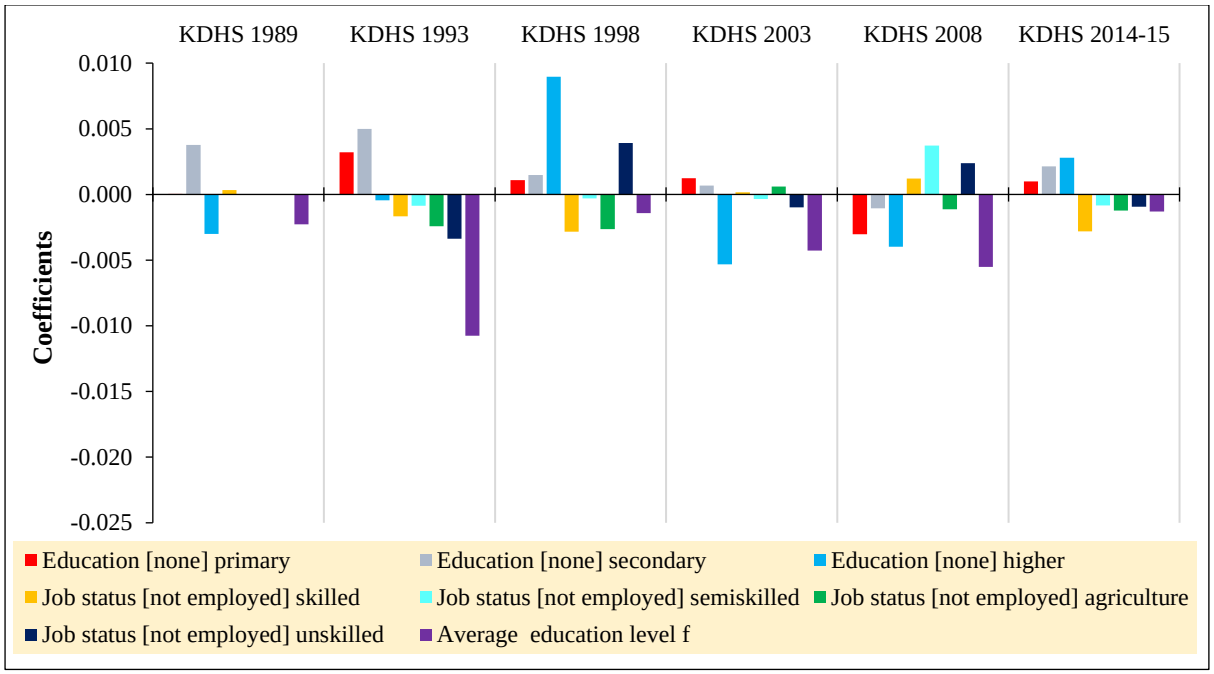


Figure 5.6: Effects of female variables on marital fertility in Kenya, DHS 1989-2014/15

The differences in the fertility rates between women with tertiary (denoted as higher) education and those without any education were notable in the KDHS surveys with the exception of the KDHS1993. However, tertiary education was not always associated with reduction in marital fertility as shown in the results for the KDHS1998 and KDHS2014-15 where positive associations were found. Living in communities with higher levels of average female education was negatively associated with individual-level marital fertility rates. This was the case for all the KDHS surveys with the effect being more pronounced in the 1993, 2003 and 2008 surveys. The community-level average female education had statistically significant negative effect on marital fertility in the KDHS1993 and KDHS2014-15. With regards to job status, being employed did not always translate to having less fertility for women in the KDHS surveys. As

shown in Figure 5.6 above, employment in semiskilled and unskilled jobs was associated with increased fertility rates for the KDHS1988 and KDHS2008 while being in skilled professions and agricultural jobs tended to reduce marital fertility rates.

The role of female background variables was more subdued in Rwanda compared to Ghana, Kenya and Zimbabwe. Among the five RDHS surveys so far collected in Rwanda, the only statistically significant difference in marital fertility rates was observed between having no education and having primary education in the RDHS1992. This difference was in the form of increased marital fertility associated with having primary education compared to no education. Despite the lack of statistical significance in the marital fertility outcomes in Rwanda over the years, the associations between female background variables and fertility rates of married women shown in Figure 5.7 below were not consistent over time. For instance, being employed in a job other than unskilled was associated with decrease in fertility for the RDHS1992 and RDHS2010 and increased fertility in the RDHS2005 and RDHS2014-15 surveys.

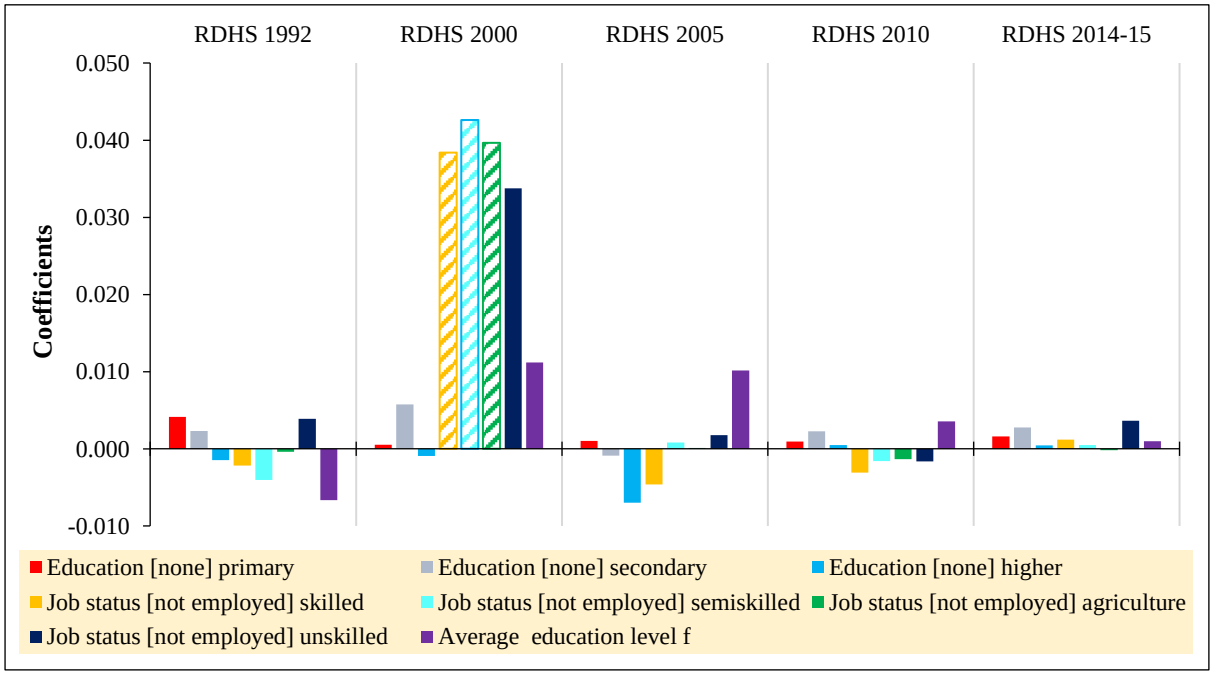


Figure 5.7: Effects of female variables on marital fertility in Rwanda, DHS 1992-2014/15

It is apparent from Figure 5.7 that results on female background variables had unique associations with fertility compared to Ghana , Kenya and Zimbabwe. Viewed in light of the trends in TMFRs presented in chapter 6, Rwanda was the only country where during stalling period female background variables had a markedly positive effect on the fertility rates of married women. The stalling period for Rwanda (1997-2004) overlapped with coverage of the RDHS 2000.

The results from the ZDHS surveys showed statistical significance of the effects of female background variables on marital fertility rates to a greater degree compared to the other countries. These results however, showed counter-intuitive significant associations in two of the six ZDHS surveys. The associations between female background factors and fertility rates for Zimbabwe are presented in Figure 5.8 below.

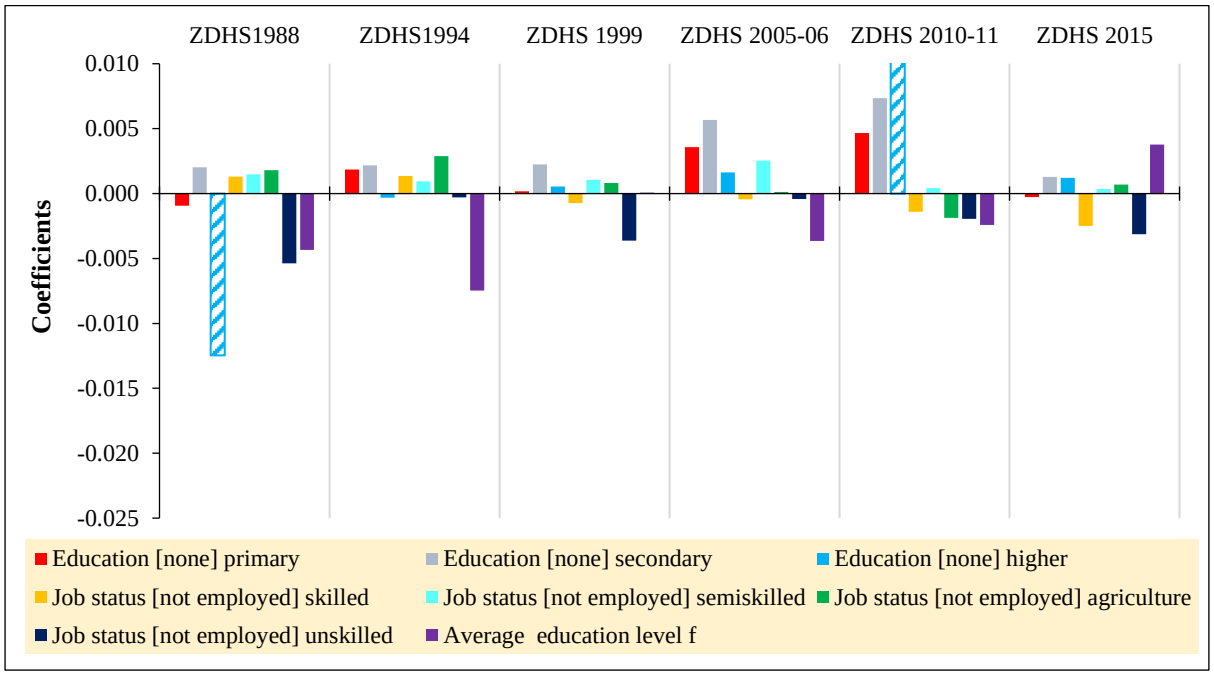


Figure 5.8: Effects of female variables on marital fertility in Zimbabwe, DHS 1988-2015

As shown in Figure 5.8 above, higher education status for women was positively associated with fertility rates in the 2005-06 and 2010-11 ZDHS surveys. The ZDHS2005-06 results show that having primary or secondary education was associated with significant increase in fertility rates relative to not having any education. The same associations between marital fertility and education were observed in the ZDHS2010-11 with respect to primary and secondary education status. The results from the ZDHS2010-11 also show that tertiary education was positively associated with marital fertility with statistical significance. This was in stark contrast to the relationship that prevailed in the 1980s as reflected in the results from the ZDHS1988 where women's tertiary education status considerably reduced fertility rates compared to when one did not have any education. While these individual-level educational characteristics were mostly positively associated with marital fertility, it was observed that at the community-level, women's average education adversely affected fertility. This was true for all ZDHS surveys except the ZDHS2015 survey.

While individual-level education tended to be positively associated with fertility in Zimbabwe, the opposite was mostly the case with individual employment characteristics. As shown in Figure 5.8, all notable negative associations between individual characteristics and fertility post ZDHS1988 involved women's employment status. The more prominent of the negative association were observed in the 1999 and 2015 ZDHS surveys where employment in unskilled and skilled jobs tended to reduce the fertility rates of married women. Unskilled employment also notably reduced the fertility rates of married women in the ZDHS1988. The results in Figure 5.8 thus reveal important lessons between female variables and fertility. Based on the results, it can be stated that education alone is insufficient to lead to a reduction in average ASMFRs after controlling for proximate and other background factors. However, participation in employment has the potential to reduce marital fertility rates.

5.5. Temporal changes in male variables' association with average ASMFRs

A component of the overall objective of this research pertained the estimation of the potential role men play in the fertility rates of women in SSA region. The first step to achieve this part of the overall objective involved estimating adjusted coefficients measuring the extent to which average ASMFRs among women varied according to the different classes of education and employment characteristics of their husbands. This section presents the results on how male characteristics were associated with marital fertility rates in the different DHS surveys from Ghana, Kenya, Rwanda and Zimbabwe. It should be noted that the results were obtained from multivariate random effects models controlling for proximate, demographic, and female characteristics among other factors. Continuing on the preceding section's presentation structure, this section follows the alphabetic order of the countries in presenting male variables' associations with marital fertility.

Fertility differentials associated with male variables were mostly statistically insignificant in the four countries studied. The results for Ghana showed that the differentials in fertility rates that were explained by male variables involved husband's education status in the GHDS1988. As shown in Figure 5.9 below, having a husband with primary or secondary education was associated with increased levels of fertility rates compared to being married to a husband with no education.

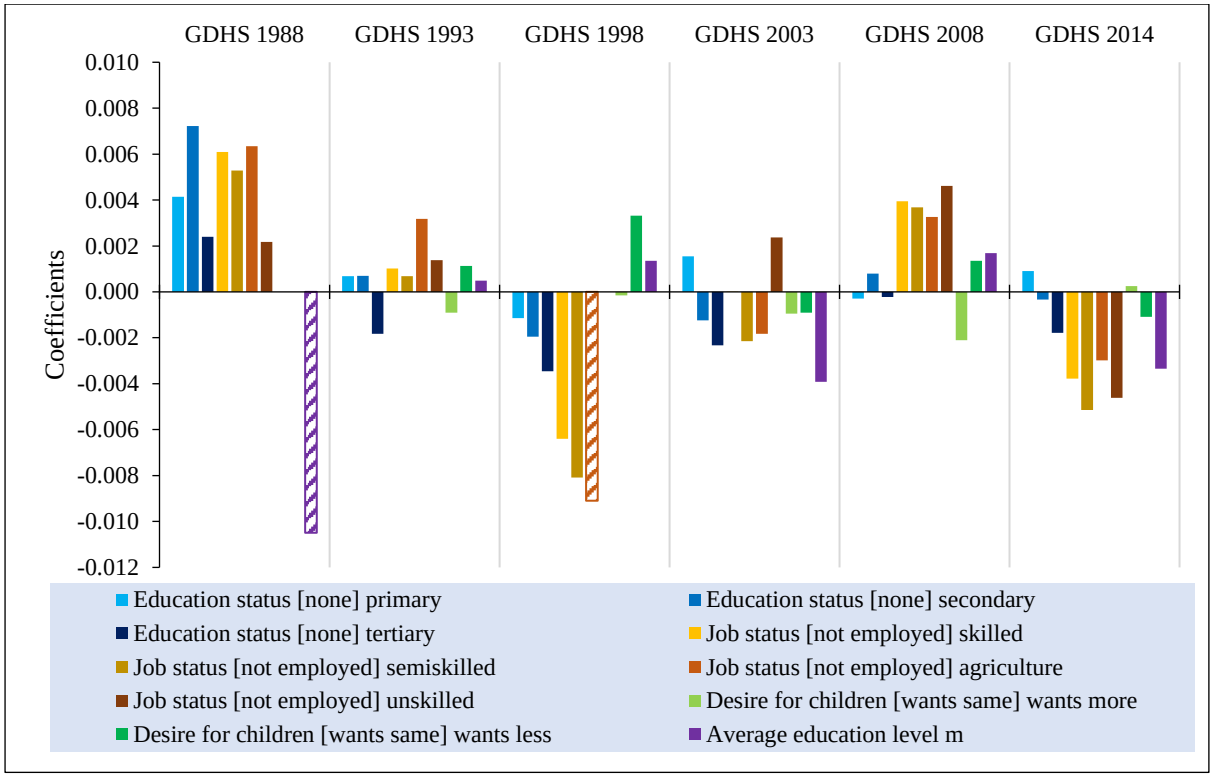


Figure 5.9: Fertility inhibiting/enhancing effects of male variables in Ghana, 1988-2014

The direction of the associations between fertility and the education statuses of the women's partners in Ghana changed over time. As shown in Figure 5.9 above, some periods like those covered by the 1988 and 1993 GDHS surveys were characterised by positive associations between partner's education and fertility rates with the exception of tertiary education. The opposite prevailed for the periods covered by the 1998 and to an extent 2003 and 2014 GDHS surveys when higher education status of husband was negatively associated with marital fertility rates.

The temporal changes in the direction of association between partner education and fertility also occurred between partner job status and fertility. The reference periods of the 1998 and 2014 GDHS surveys were characterised by reductions in fertility rates associated with having a husband who was employed compared to being in a union with a male partner who was not employed. In the other periods like those covered by the 1988, 1993 and 2008 GDHS surveys,

having a husband who was employed was associated with increased fertility rates compared to having a partner who was not employed. The positive associations between having an employed husband and fertility rates were observed in the GDHS surveys (1988 and 2008) with reference periods which were characterised by annual increases in TMFRs. These positive associations may therefore potentially suggest that increased fertility rates due to having an employed husband contributed towards fertility stalling in Ghana. This is a plausible argument considering that the occurrence of negative associations between husband's education and fertility, observed in the GDHS1998 and GDHS2014, coincided with periods of annual declines in TMFRs or shortly after a period of sustained annual decreases in TMFRs. These results thus can be regarded to be pointing at the importance of male variables in the marital fertility transition of Ghana.

Data on husband's desire for children in Ghana was available in five surveys starting with the GHDS1993. The type of association between this variable and fertility rates changed over time although observed coefficients for the categories of husband's desire for children were not statistically significant. The results for Ghana showed that women with husbands who desired more children tended to have lower fertility compared to those who had similar desires for children in three (1993, 2003 and 2008) of the five surveys. In the other two surveys namely the GDHS1998 and GDHS2014, having a husband who desired more children did not differentiate the fertility rates of these women from those who shared similar desires with their husbands. Meanwhile, having a husband who desired less children was associated with increased fertility rates compared to having one who had the same desires as the woman in the 1993, 1998 and 2008 GDHS surveys while the opposite was observed in the 2003 and 2014 surveys.

An understanding of the results on husband's desire for children in relation to the potential effects on the fertility rates of women calls for one important consideration. Women who currently have low fertility may likely have husbands who still want more, while those who have achieved higher parities may have greater likelihood of having a husband who now wish he had fathered less children. Consequently, husbands of women with high parities may report that they desire less children while the husbands of women with lower parities may report that they desire more children. Therefore, this leads to counter-intuitive positive associations between desiring less children and marital fertility rates. The importance of husband's desire for more children may thus being relation to understanding future changes in marital fertility rates. Where a greater proportion of women report that their husbands desire more children, there is likelihood of marital fertility rates to be higher in the future than in the current survey.

The community-level average of male education was positively associated with fertility rates in two of the six GDHS surveys. This was observed in the GDHS1998 and GDHS2008 despite the positive associations falling below the threshold of statistical significance. There were negative associations between fertility and community-level of male education in the 1988, 2003 and 2014 GDHS surveys. In these surveys, the increase in the proportion of married men with secondary or higher education was associated with the reduction in marital fertility rates for women. This was more pronounced in the GDHS1988. The results for Ghana can be regarded as providing to an extent some evidence to suggest the potential of increased male education to have a notably depressing effect on marital fertility rates especially at the community level.

The effects of male variables on marital fertility were also statistically insignificant in Kenya, but insightful knowledge about the potential role of male education and employment in fertility rates can be drawn from the results. As shown in Figure 5.10 below, male variables especially job status tended to be positively associated with marital fertility rates during the stalling periods. It has already been shown in Chapter 4 that the stalling of marital fertility transition stretched from the second half of the 1990s to the year 2002, a period covered by the 1998 and 2003 KDHS surveys.

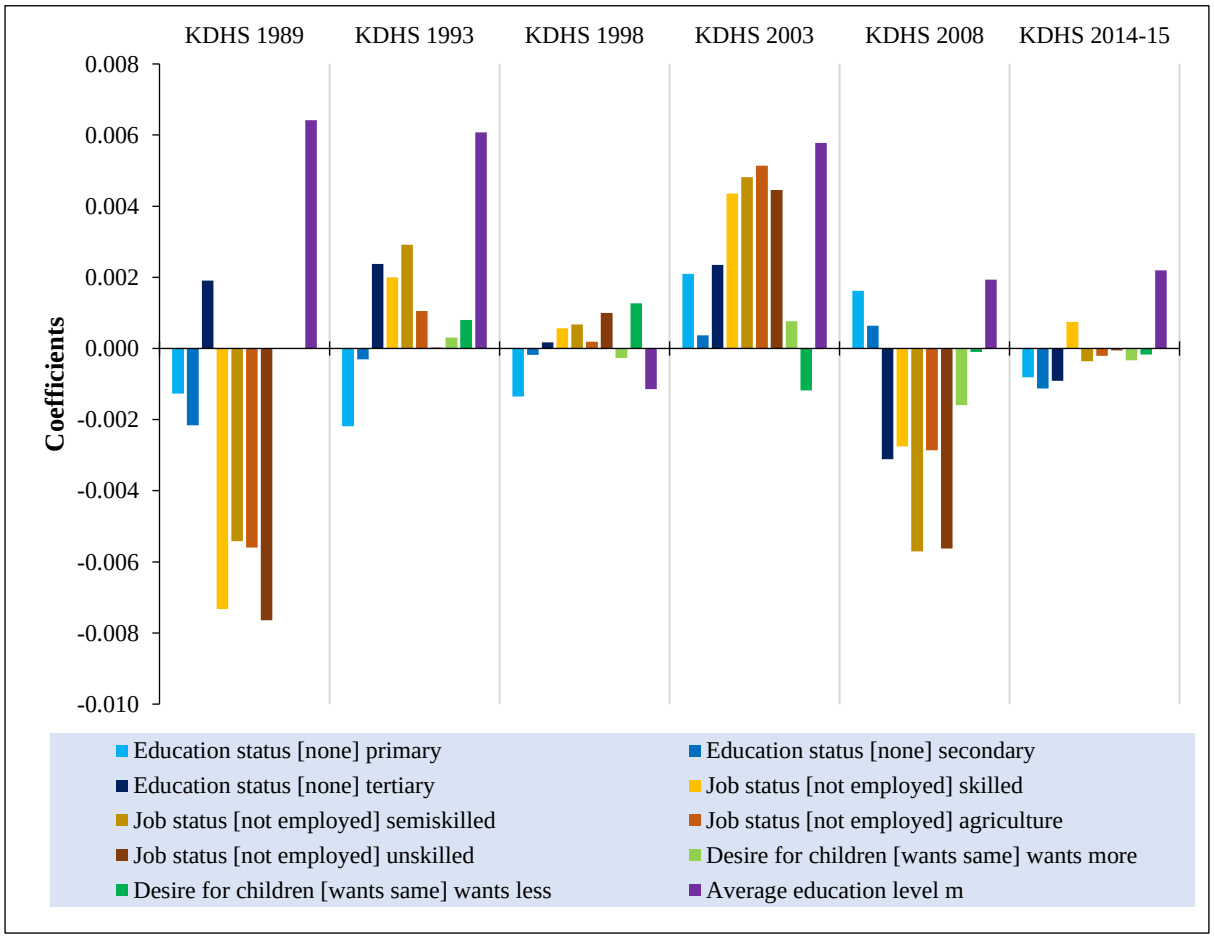


Figure 5.10: Fertility inhibiting/enhancing effects of male variables in Kenya, DHS 1989-2014

The results for the KDHS1989 and KDHS2014 showed that having a husband who was employed was associated with a decrease in marital fertility rates in [Figure 5.10]. The TMFR trends for Kenya presented in chapter 4 showed that the years covered by the 1989 and 2014

KDHS surveys were characterised by considerable declines in marital fertility. The results shown in Figure 5.10 may therefore point to the importance of husband's employment status on the fertility rates of married women. The results from the first three surveys from Kenya for 1989, 1993 and 1998 show that relative to having an uneducated husband, having a husband with primary education only tended to decrease fertility rates. There was a similar effect on fertility associated with having a husband with secondary education in the KDHS1989 and ta a less extent the KDHS2014-15. The results from the 2003 and 2008 KDHS surveys revealed a reversal in the direction of association between marital fertility rates and husband's primary and secondary education. In these surveys, the education of the husband was positively associated with marital fertility. It can be noted from Kenya's TMFR trends from chapter 6 that the two years preceding the collection of the 2003 and 2008 KDHS surveys were characterised by increased TMFRs on a year-to-year basis. The positive associations between husband's education and fertility in the 2003 and 2008 KDHS surveys may therefore suggest men's contributions to the stalling of fertility in Kenya.

The results for husband's tertiary education highlight temporal changes in the types of relationships between this variable and fertility. In the early surveys collected in 1989, 1993 and 2003, husband's tertiary education status was associated with increase in marital fertility, but negative associations prevailed in the 2008 and 2014-15 KDHS. The average level of male education in the community was mostly positively associated with marital fertility rates in Kenya. This is demonstrated in the positive coefficients shown in Figure 5.10 which represent increased fertility rates as the community-level of male education increased in all the KDHS surveys except the KDHS1998. The effect of community-level of male education was however subdued in the 2008 and 2014-15 surveys compared to the three previous surveys where positive relationships were observed. With regards to husband's desire for children, results for

Kenya showed that this variable had the least impact of all the male variables on marital fertility differentials. The reference category for this variable was women who shared the same desires for children with their husbands. The effects of husband's desire for children on fertility differentials were observed in the 1993, 1998 and 2003 surveys albeit being insignificant at 95% confidence level. As shown in Figure 6.10, having a husband who desired less children was associated with increased marital fertility rates in the 1993 and 1998 surveys but tended to reduce fertility in the 2003 survey.

The employment status of husbands viewed over the entire period covered by the KDHS surveys gives the impression of a bell-shaped temporal relationship with female marital fertility rates. The relationship starts off as negative in the KDHS1989 whereby having a husband in any form of employment was associated with decreased fertility rates relative to being wife to a man who was not employed. This was also the case in the KDHS 2008 and to a less extent the KDHS 2014-15 although with the exception of skilled employment. The intervening period covered by the 1993, 1998 and 2003 KDHS surveys, which was also the period of stalled transition in Kenya, was characterised by increased fertility rates associated with having an employed husband compared to being married to one who was not employed.

The analysis of the KDHS surveys revealed temporal changes in the nature of the relationships between marital fertility rates and male characteristics which contrasted with results for Rwanda. The results for Rwanda are presented in Figure 5.11 below.

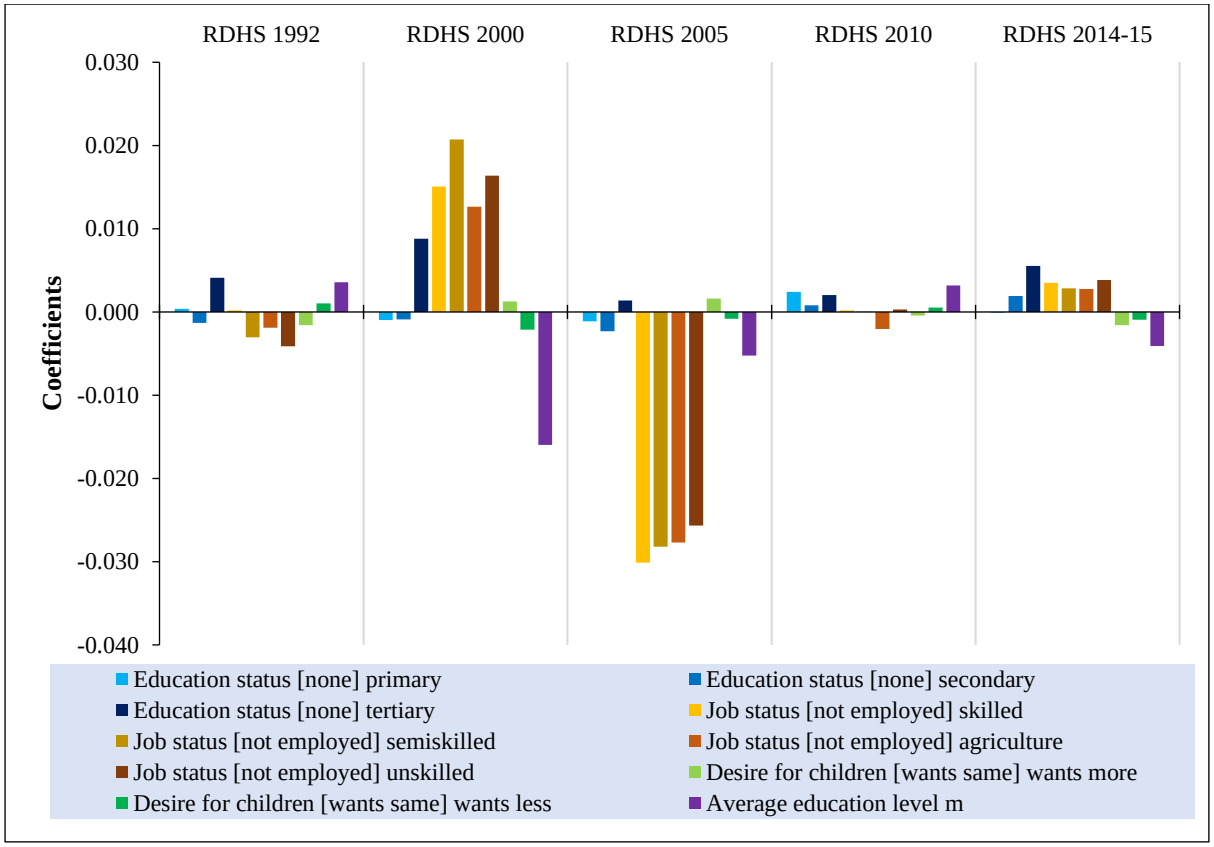


Figure 5.11: Fertility inhibiting/enhancing effects of male variables in Rwanda, DHS 1992-2014/15

The first three RDHS surveys, 1992, 2000 and 2005 give the impression that the association between husband's education status and marital fertility rates followed a Kuznets curve. As shown in Figure 5.11 above, fertility rates decreased with husband's characteristics in the RDHS1992 and increased in the RDHS2000. The results for the RDHS2005 show that marital fertility tended to decrease in association with most of the male characteristics. In the last two RDHS surveys collected in 2010 and 2014-15, husband's education status tended to be positively associated with fertility rates with the positive association appearing to be more pronounced in the latter survey.

The employment status of a husband had relatively more influence on marital fertility differentials in Rwanda compared to the other male variables. Nonetheless, there was one instance when job status explained differences in the average ASMFRs of married women with statistical significance. This was in the RDHS2005 where having a husband who was employed in a skilled profession was associated with significant reduction in fertility. There were also fertility inhibiting effects associated with having a husband who was employed in any of the job types in the RDHS1992 and RDHS2005.

There were no significant differences in the marital fertility rates among women when categorised by husband's desire for children in Rwanda. Moreover, unlike other male variables, the differences in marital fertility rates associated with husband's desire for children were almost zero in all the RDHS surveys. There were also no significant changes in marital fertility rates involving community-level education status of men. Nonetheless, it can be observed from Figure 5.11 that the increase in the average of community-level education of men tended to influence a decrease in marital fertility rates in the periods covered by the 2000, 2005 and 2014-15 surveys. Despite being statistically negligible, these results may be regarded as pointing towards the potential importance of increased levels of education in the quest to enhance marital fertility transition of Rwanda and ultimately slowing down population growth rates.

The results from the ZDHS surveys revealed associations between marital fertility rates and male characteristics in Zimbabwe that were mostly statistically insignificant just like in the other three countries as already shown above. The relative prominence of the male variables in Zimbabwe however were unique compared to the other countries. In Zimbabwe, husband's education status was a more prominent variable in explaining differences in average ASMFRs

over the entire period covered by the six ZDHS surveys. The results for Zimbabwe are presented in Figure 5.12 below.

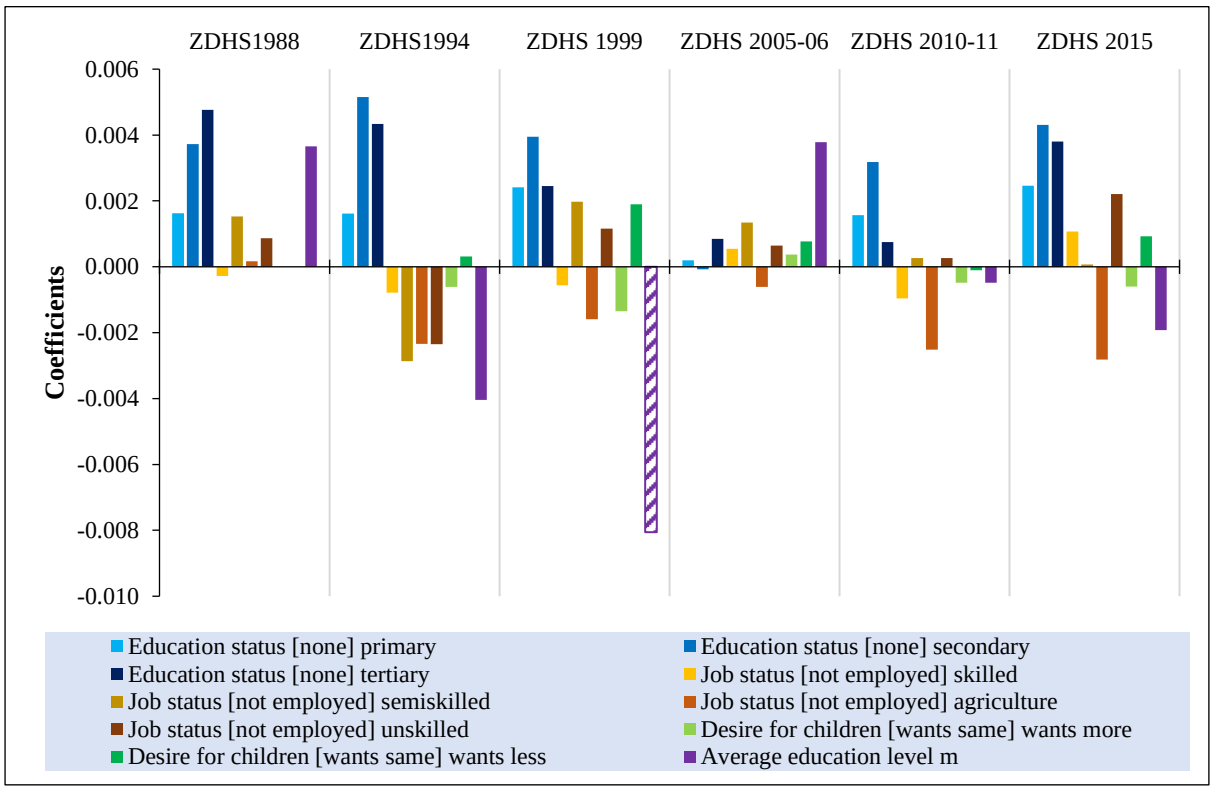


Figure 5.12: Fertility inhibiting/enhancing effects of male variables in Zimbabwe, DHS 1988-2015

The results presented in Figure 5.12 above show that average ASMFRs of women from Zimbabwe increased with husband's education status for most of the history of TMFR transition since the 1980s. With the exception of the ZDHS2005-06, having a husband with primary or higher education status was associated with increased marital fertility rates compared to when a woman had a husband with no education. The positive associations between individual-level husband's education status and fertility did not translate to community-level effects of male education. When male education was transformed and examined at the community-level, it was observed that there were observable marital fertility inhibiting effects of living in communities where the average educational attainment of married men in the 1994, 1999 and 2015 ZDHS surveys. The observable effects of community-level

male education appearing to enhance marital fertility were found in only two surveys ZDHS1988, and ZDHS2005-06.

The effects of husband's job status were subdued compared to education over the history of the TMFR transition in Zimbabwe. Nonetheless, results reported in Figure 6.12 show that there were periods when husband's job status appeared to be associated with differences in average ASMFRs among women. In the 1988, 1999 and 2005-06 ZDHS surveys, having a husband in semiskilled or unskilled employment was associated with increase in fertility compared to having a husband who was not employed. The effect of being married to a husband in an agriculture job tended to reduce the marital fertility rates in all the surveys except the ZDHS1988. The ZDHS1994 was the only survey where any form of employment for men had an inhibiting effect on fertility. It is worth pointing out that the reference period of the ZDHS1994 was characterised by rapid annual declines in TMFRs as presented in chapter 5.

The results for husband's desire for children in Zimbabwe were not consistent across the surveys in Zimbabwe. In all the surveys survey for which data were available except for the ZDHS 2005-06, having a husband who desired more children was associated with reduction in fertility compared to when both wife and husband had the same desire for children. Meanwhile, there was the tendency for fertility to increase when married to a husband who desired less children especially in the 1999, 2015 and to a less extent 1999 ZDHS surveys.

5.6. Demographic variables and average ASMFR differentials: Time-based analysis

The demographic variables especially age group proved to be significant predictors of differentials in fertility rates throughout the history of the marital fertility transitions of Ghana,

Kenya, Rwanda and Zimbabwe. There were however variations across the countries in terms of how age was associated with marital fertility. This section presents the marital fertility effects of demographic variables, continuing with the time-based inclination in interpreting the role of the predictors in fertility rates in the four countries. Consistency is also maintained from previous sections in terms of the alphabetic order of presenting the results starting with Ghana followed by Kenya, Rwanda and ending with Zimbabwe. Nonetheless, comparisons across countries are also drawn where relevant.

The associations between age group and fertility in Ghana largely remained stable over the 26-year period covered by the six surveys from 1988 to 2014 [Figure 5.13 below].

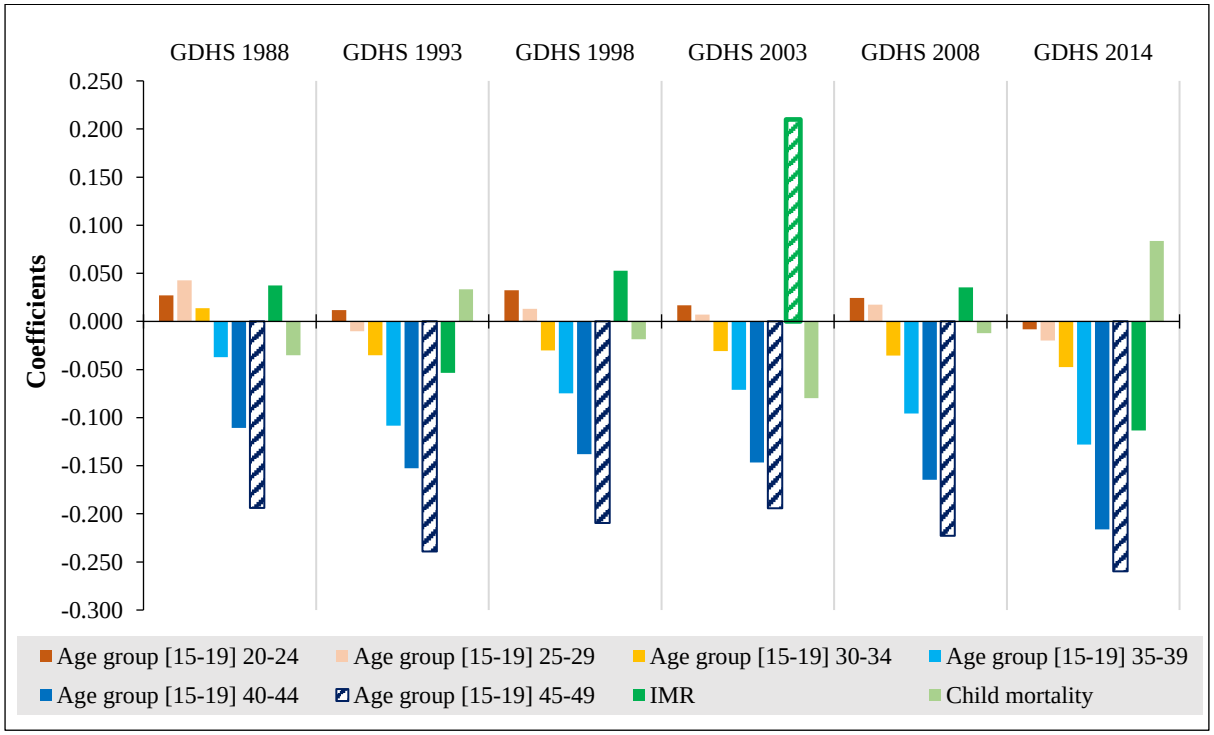


Figure 5.13: Adjusted effects of demographic variables on fertility in Ghana, DHS 1988-2014

There were progressive increases in the magnitude of decrease in fertility from the 35-39 to 45-49-year age group compared to the base category. In all the surveys with the exception of

the GDHS1988, the 20-24-year age group was associated the largest increase in fertility compared to the 15-19-year age group. In the GDHS1988, the results presented in Figure 5.13 show that the highest increase in ASMFRs due to age group occurred in the 25-29-year age group. There were also increases in ASMFRs associated with the 25-29-year age group in the 1998 and 2008 GDHS surveys relative to 15-19-year age group. The GDHS1988 also showed increase in ASMFRs for the 30-34-year age group compared to the 15-19-year age group. The increase in marital fertility rates with age beyond 30 years can be interpreted as characteristic of high fertility regimes. As shown in chapter 6, the TMFRs of Ghana were lower in 2014 survey compared the 1988 survey and this may explain why 30-34-year age group was associated increased fertility compared to the 15-19-year age group in the GDHS1988 but not in the GDHS2014. The regression results reported in Figure 6.13 above show that while women aged 20-29 years mostly experienced increased ASMFRs relative the 15-19-year olds in the first five KDHS surveys, the opposite was observed in the GDHS2014-15.

The effect of infant and child mortality rates on marital fertility in Kenya were mostly statistically insignificant. Nonetheless, ASMFRs tended to increase when women live in communities with higher infant mortality rates (IMR). This was observed in four of the six GDHS surveys namely the GDHS1988, GDHS1998, GDHS2003 and GDHS2008. Where IMR was negatively associated with ASMFRs, child mortality showed positive association with fertility. Overall, the results for Ghana provided an indication of marital fertility increasing in association with living in communities with higher infant mortality compared to child mortality.

The adjusted effects of age group on marital fertility rates for Kenya suggested a more defined peak in the 20-24-year age group compared to the results from the other countries like Ghana and Zimbabwe. The results for Kenya are presented in Figure 5.14 below.

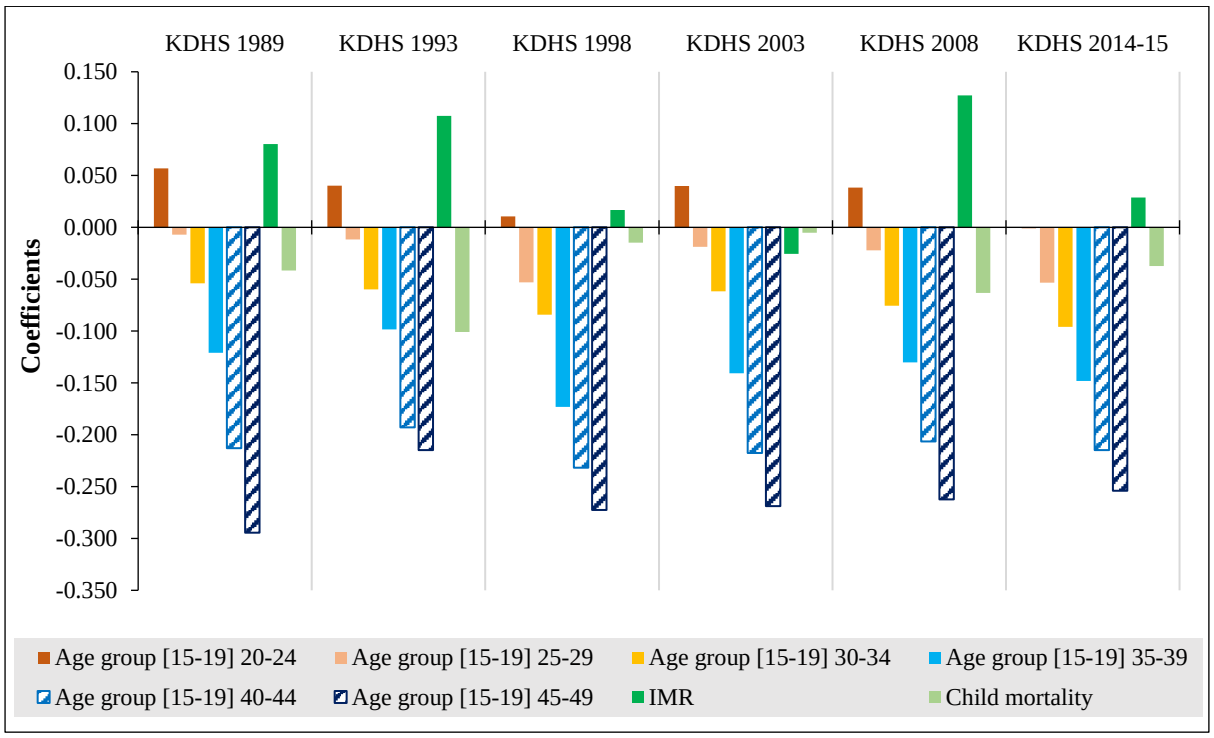


Figure 5.14: Adjusted effects of demographic variables on fertility in Kenya, DHS 1989-2014/15

In four (1989 1993, 2003 and 2008) of the six KDHS surveys, regression results showed that being in the 20-24-year age group was the only age characteristic associated with notable increases in fertility rates compared to the 15-19-year age group. Being in the other age groups was associated with decreases in fertility rates compared to the 15-19-year age group in all the KDHS surveys. The decrease in ASMFRs with age group starting with 25-29 years was greater in Kenya compared to the other countries like Ghana and Zimbabwe where comparable results were found. As of the last KDHS survey, the ASMFRs of the 15-19 and 20-24-year age groups were not different. The results presented in Figure 5.14 show that ASMFRs were negatively associated with child mortality for all the surveys from Kenya despite the lack of statistical

significance. With respect to IMR, adjusted coefficients indicated positive associations in five of the six KDHS surveys. Overall, ASMFRs tended to be positively associated with infant mortality and positively associated with child mortality.

While the general picture of the age group-marital fertility associations in Ghana, Kenya and Zimbabwe suggested a continuous decline in ASMFRs post 15-19-year age group, the situation in Rwanda was less reflective of this clear shift in age patterns of fertility. The results for Rwanda are presented in Figure 5.15 below. Although to an extent the magnitude of the increase in ASMFRs of the 20-24 and 25-29-year age groups declined over time relative the 15-19-year age group, Rwanda's ASMFRs continued to increase post-teenage years up to 29 years by the last survey of 2014-15.

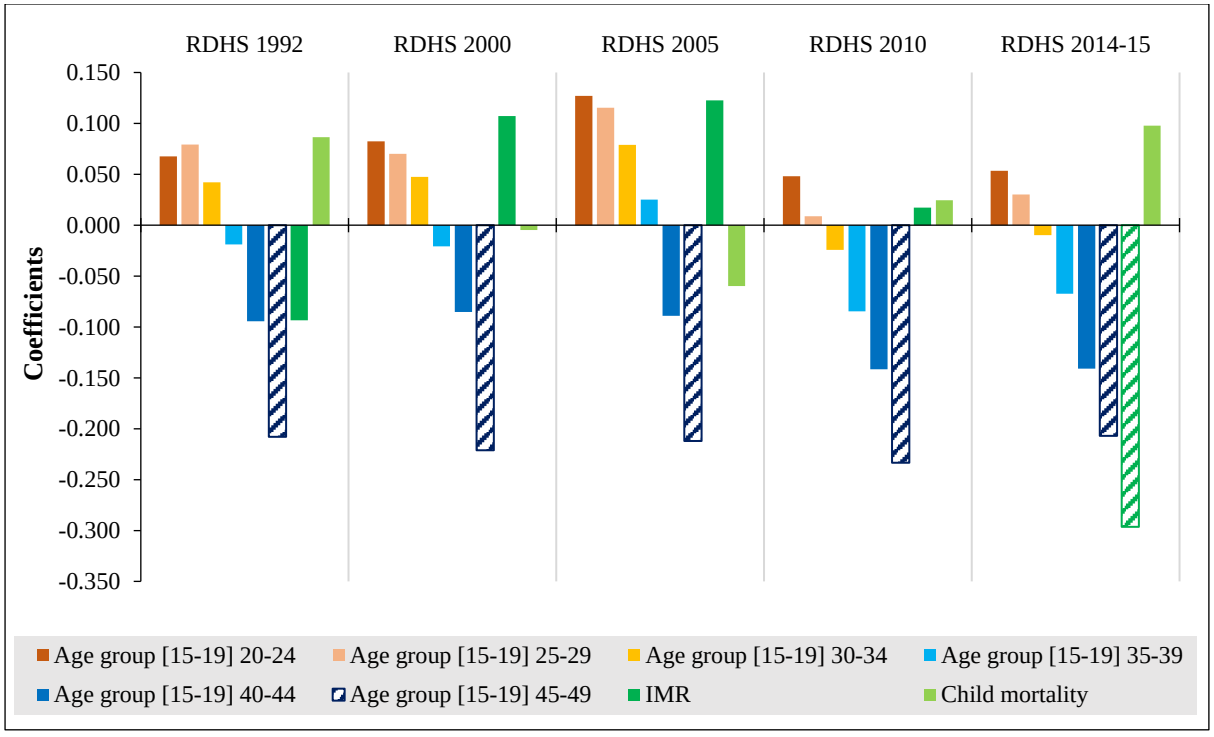


Figure 5.15: Adjusted effects of demographic variables on fertility in Rwanda, DHS 1992-2014/15

The results presented in Figure 5.15 above show that the 20-24 and 25-29-year age groups were associated with increased ASMFRs relative to the 15-19-year age in all the five RDHS surveys. The first three surveys collected in 1992, 2000 and 2005 showed significant increases in marital fertility in association with being in the 20-24, 25-29 and 30-34-year age groups. With the exception of the RDHS1992, the results for Rwanda imply that peak ASMFRs occurred in the 20-24-year age group. The trends in TMFRs based on three-year average point estimates presented in chapter 6 showed that marital fertility started by increasing in Rwanda, peaking in the RDHS2005 after which fast decline prevailed. The period of peak TMFRs covered by the RDHS2005 was characterised by increased ASMFRs associated with four age groups namely 20-24, 25-29, 30-34 and 35-39 years relative to the teenage age group. This means that this period witnessed sustained high marital fertility rates for 20 years at levels higher than those experienced at teenage stage.

The results for CMR in Rwanda showed both positive and negative associations with marital fertility over time. There were positive associations particularly in the 2000 and 2005 RDHS surveys of infant mortality on ASMFRs. Meanwhile, the increase in child mortality rates tended to positively impact on ASMFRs in the 1992, 2010 and 2014-15 RDHS surveys. It can be noted, in the light of TMFR trends presented in chapter 4, that the positive effects of IMR on ASMFRs occurred were found in the surveys that covered periods characterised by inter-survey increases in TMFRs in Rwanda. Examples of these inter-survey periods characterised in TMFRs increases were the phase 3 to phase 4 and phase 4 to phase 5 as shown in chapter 4 (Figure 5.1)

The adjusted ASMFR effects of age group in Zimbabwe appeared to be similar to those observed for Ghana and Kenya, but careful scrutiny reveals unique time-based patterns. The results for Zimbabwe presented in Figure 5.16 below show that marked peaks in ASMFRs occurred in the 20-24-year age group in the first two surveys only – ZDHS1988 and ZDHS1994. In the ZDHS1999, all age groups were associated with significant decreases in fertility relative to the 15-19-year age group. Unlike in Ghana and Kenya where the 20-24-year age group was associated with increased ASMFRs except in the last surveys, there were no significant differences in ASMFRs between the 15-19 and 20-24-year age groups in Zimbabwe for the surveys collected after the year 2000.

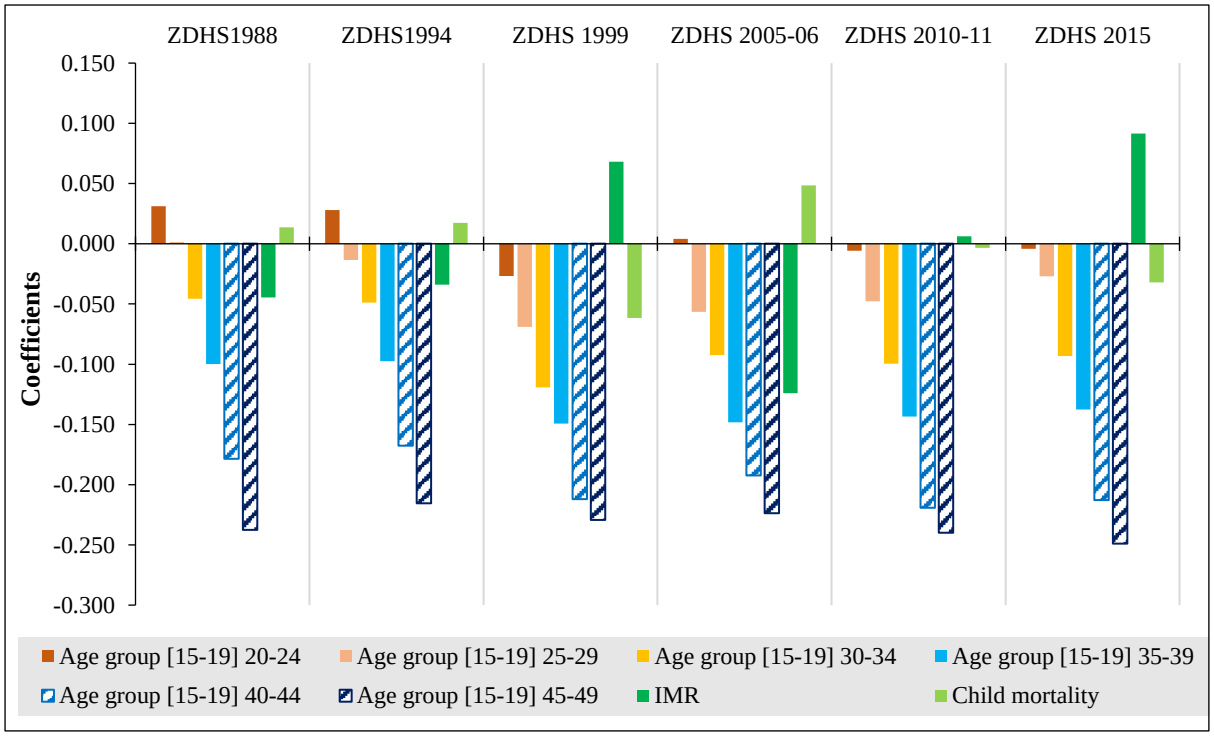


Figure 5.16: Adjusted effects of demographic variables on fertility in Zimbabwe, DHS 1988-2015

The associations between marital fertility and IMR changed over time in Zimbabwe. As shown in Figure 6.16 above, the ASMFRs tended to increase if one lived in communities with high IMRs in the ZDHS1999 and ZDHS2015. Meanwhile, living in communities with higher IMRs

appeared to be associated with decreases in ASMFRs in the ZDHS1988, ZDHS1994 and ZDHS2005-06 surveys. The results for the ZDHS2010-11 showed that there was virtually no change in ASMFRs due to community-level differentials in IMR and CMR. In understanding the effects of infant and child mortality on ASMFRs in Zimbabwe, it should be noted that the observed results were mostly statistically insignificant just like in Ghana, Kenya, and Rwanda. The lack of statistical significance does not however diminish the relevance of especially IMR in the temporal changes in marital fertility levels in all the four countries.

5.7. Effects of socioeconomic and geographic variables on ASMFRs over time

The socioeconomic and geographic variables presented in this section are household SES, religion, and place of residence. The structure of the presentation follows on the previous sections, adopting a temporal perspective as well as inter-country lateral comparisons of the impacts of the variables on marital fertility rates.

The results of the adjusted effects of household SES, religion and place of residence on ASMFRs for Ghana are presented in Figure 5.17 below. In reading the results reported in Figure 5.17, one needs to note that the coefficients for measuring the impact of household wealth, religion and urban residence appear to be smaller compared to those for the other three countries, but they are comparably of similar magnitudes. The impact of these socioeconomic and geographic variables appears more subdued in Ghana because in the GDHS2003 the coefficient for other Christian was above 0.06 when the other coefficients for Ghana and the other three countries were below 0.01 for all surveys. Consequently, it gives the impression that household wealth, religion and urban residence were virtually anonymous in explaining ASMFRs differentials in Ghana compared to the other countries.

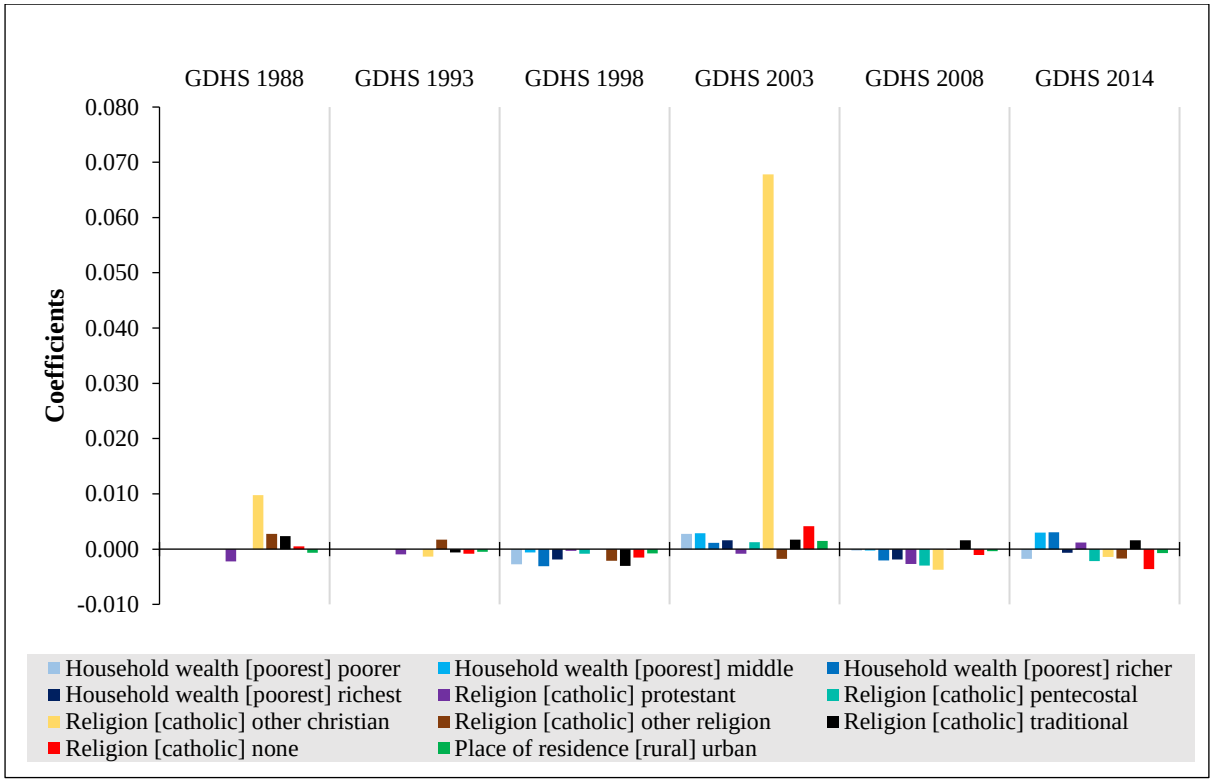


Figure 5.17: Impacts of household wealth, religion and urban residence on ASMFRs in Ghana, DHS 1988-2014

The overall picture of the results presented in Figure 5.17 viewed from a time-based perspective is that the effects of household wealth status, religion and urban residence on ASMFRs changed over time, showing inhibiting effects at some periods and positive impacts at other periods. The ASMFRs tended to increase for women who were not Catholic for the GDHS1988. This was also the case for the early 2000s as observed in GDHS 2003. With respect to household SES, the GDHS2003 results showed that this variable was positively associated with ASMFRs in the early 2000s. On the contrary, the late 1990s and 2000s as reflected in the results from the 1998 and 2008 GDHS surveys respectively were characterised adverse effects of household wealth on ASMFRs. Living in poorer, middle, richer and richest households during the second half of the 1990s and 2000s decades was associated with reductions in ASMFRs compared to living in poorest households. Urban residence was not associated with notable decrease or increase in ASMFRs for all the GDHS surveys. Based on the results in Figure 5.17, it can be

concluded that controlling for proximate and other background variables, there were statistically negligible differences in the ASMFRs for women when they were classified by household wealth, religion and rural-urban residence.

The adjusted effects of household SES, religion, and urban residence for Kenya presented in Figure 5.18 below show similar levels of lack of statistical insignificance with those for Ghana, Rwanda and Zimbabwe.

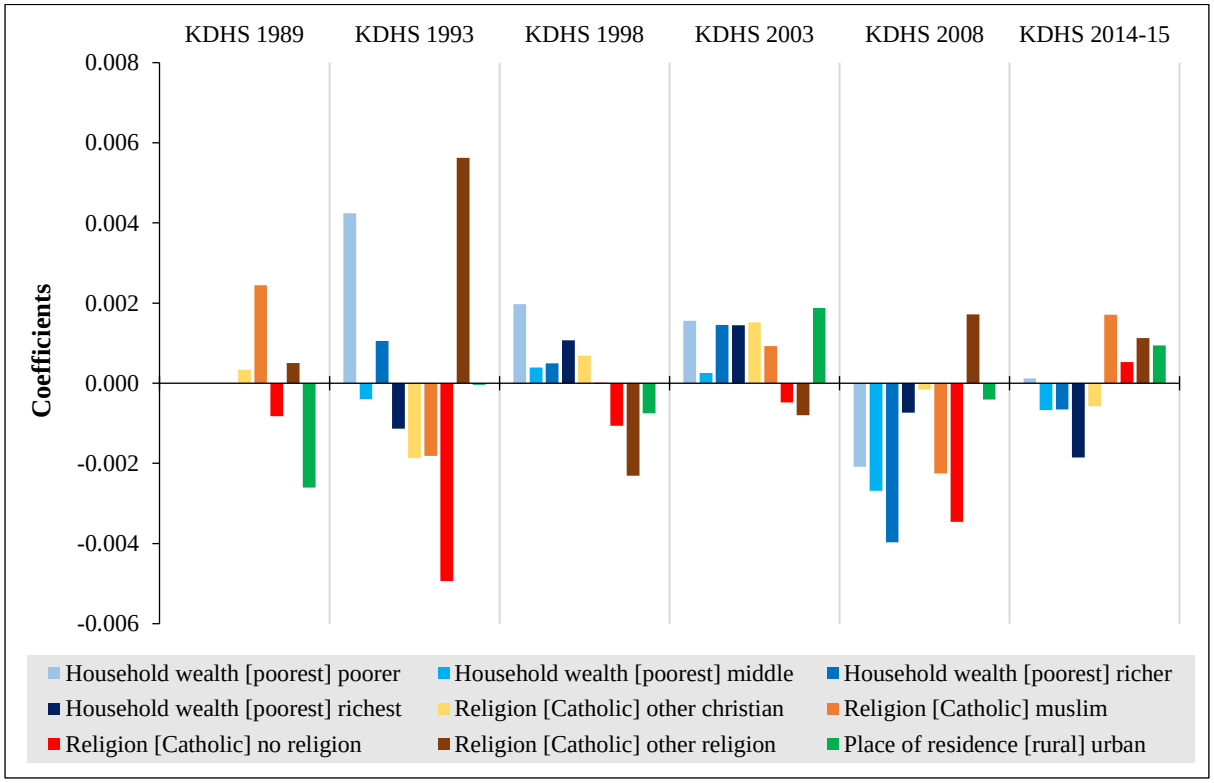


Figure 5.18: Impacts of household wealth, religion and urban residence on ASMFRs in Kenya, DHS 1989-2015/15

As shown in Figure 6.18 above, the differentials in ASMFRs due to household SES, religion and rural-urban place of residence were all within 0.01 percentage-points for all the surveys from Kenya. There were however discernible patterns reflecting a general tendency for ASMFRs to increase or decrease with household SES for the different KDHS surveys. For

instance, ASMFRs appeared to generally increase for women living in poorer, middle, richer and richest households compared to those from the poorest households for the 1993, 1998 and 2003 KDHS surveys. The reverse was observed in the last two KDHS surveys – 2008 and 2414-15 – where living in a household with higher wealth status than poorest appeared to inhibit marital. With respect to religion, ASMFRs tended to decrease for women with no religion compared to Catholics for all the KDHS surveys except the KDHS2014-15. The other types of religious beliefs showed positive and negative associations with ASMFRs relative to Catholic from one survey to another over time. The results for Kenya also showed that for the KDHS1989, KDHS1998 and KDHS2008, living in urban areas was associated with reduction in marital fertility compared to rural residence while the opposite prevailed in the 2003 and 2014-15 KDHS surveys.

The differentials in ASMFRs due to variability in household SES, religion and rural-urban residence for Rwanda were statistically insignificant after controlling for proximate and other background variables. Nonetheless, the results shown in Figure 5.19 below depict an apparent pattern that can be observed over the course of the period covered by five RDHS surveys especially when interpreted in relation to the TMFRs presented in Figure 4.1, of the previous chapter. As shown in Figure 5.19, the improvement in household SES had an inhibiting effect on ASMFRs in the RDHS1992, RDHS2014-15 and to an even greater extent the RDHS2008 while the reverse was observed for the RDHS2005. It can be observed that the diminishing of the fertility inhibiting effects of household SES in the RDHS2005 occurred at a time when TMFRs for Rwanda reached their peak levels in the mid-200s having been on a rising trend for the first two RDHS surveys. The high TMFRs observed in the RDHS2005 were thus partly reflective of the erosion of ability of proximate and background factors including household SES to exert adverse impact on marital fertility.

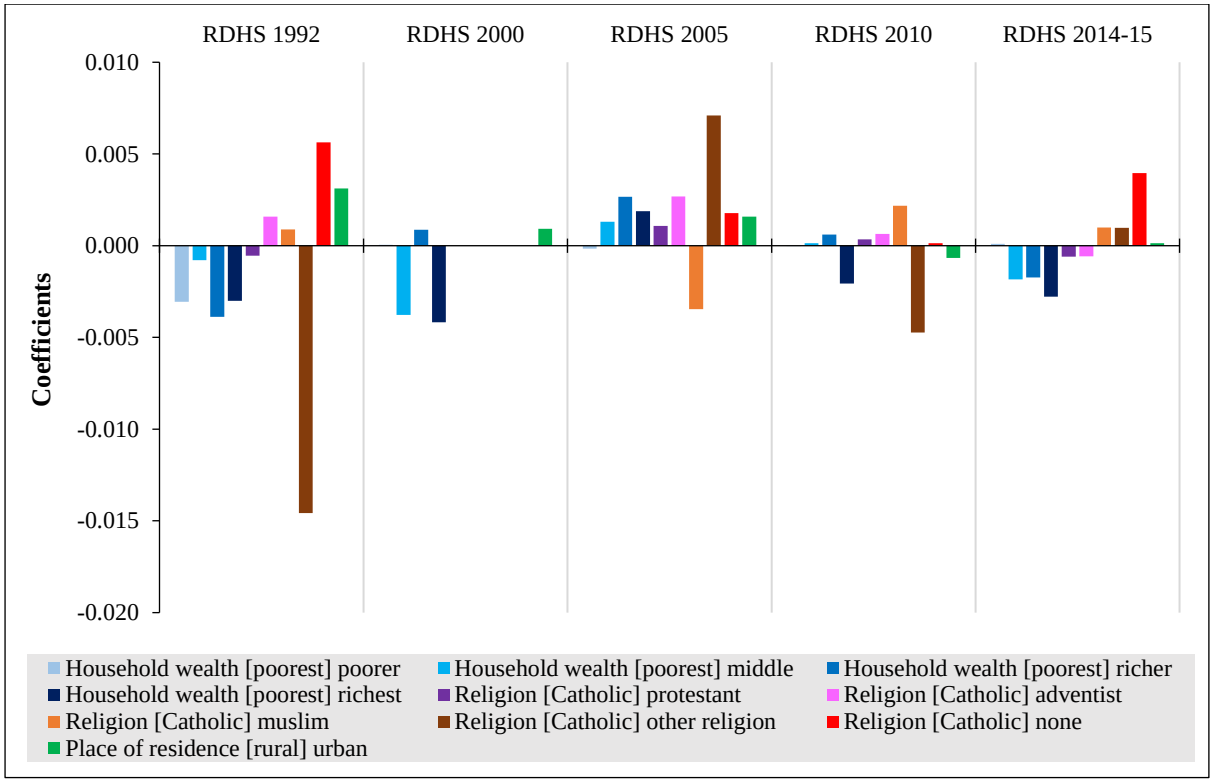


Figure 5.19: Impacts of household wealth, religion and urban residence on ASMFRs in Rwanda, DHS 1992-2014/15

The more notable differentials in ASMFRs due to religion for Rwanda occurred between Catholic women and those in other religion. This was observed in the RDHS1992, RDHS2005 and RDHS2010. Being in other religion was associated with decrease in AMSFRs relative to being Catholic in the RDHS1992 and RDHS2010 surveys while the opposite was observed in RDHS2005. Age-specific marital fertility rates also appeared to increase for women who were Adventist in the 1992, 2005 and 2010 RDHS surveys compared to their Catholic counterparts. With respect to place of residence, living in an urban area was associated with increased ASMFRs for the first three RDHS surveys although this was statistically negligible.

The estimates of the amount of change in ASMFRs associated with variations in household SES, religious belief systems and place of residence for Zimbabwe are presented in Figure 5.20

below. It should be noted that while the Figure may visually appear to reflect greater ASMFR differentials based on the respective independent variables, the actual coefficients were comparable to those observed in Ghana, Kenya and Rwanda as they also depicted differences ranging within the 0.1 percentage-points range.

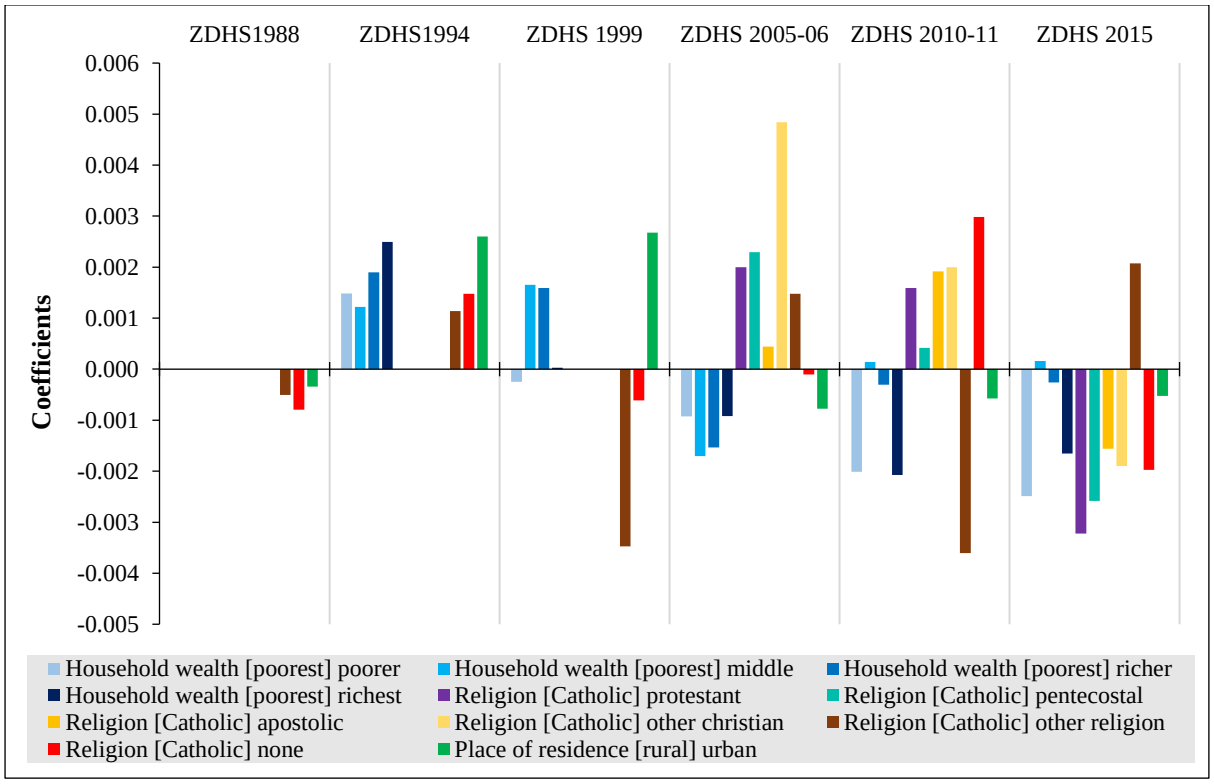


Figure 5.20: Impacts of household wealth, religion and urban residence on ASMFRs in Zimbabwe, DHS 1988-2015

The role of household SES in ASMFR differentials in Zimbabwe shifted from appearing to enhance fertility in the 1990s to inhibiting in the post-2000 era. As shown in Figure 5.20 above, higher household SES was associated with increased ASMFRs for the ZDHS1994 and to an extent the ZDHS1999. The post-200 era was characterised by a reverse of the 1990s results as higher household wealth status had an inhibiting effect on ASMFRs with the magnitude of decrease in ASMFRs as household SES increased appearing to grow over time. There was a similar shift from enhancing to inhibiting of ASMFRs involving urban residence. The 1990s decade was characterised by increased ASMFRs associated with living in urban areas while

the post-2000 era saw ASMFRs decrease in association with residing in urban areas compared to rural areas. With respect to religion, the early 1990s and 2000s were characterised by increased ASMFRs for women who were not Catholics. This is reflected in the results for the 1994, 2005-06 and 2010-11 ZDHS surveys where positive coefficients were observed for the religious beliefs in relation to Catholic. As of the ZDHS2014-15 however, coefficients for different religious beliefs were negative in comparison to Catholic except for other religion. Nonetheless, differences in religious beliefs were not significant predictors of ASMFR variabilities for women in Zimbabwe. This was also the case with regards to living in urban areas compared to rural areas.

5.8. Chapter summary

This chapter presented the research results from multivariate multilevel linear regression models estimating adjusted effects of proximate and background variables on marital fertility. The results have shown that female variables explained fertility differentials during transitional periods but not stalling phases with this being observed in Ghana. The chapter was also able to show evidence of male variables having an important role in the cross-sectional marital fertility differentials, for instance husband's job status being significant in Rwanda and husband's education status in Zimbabwe. Based on the findings from multilevel models, it can be concluded that a full appraisal of marital fertility transition can only be attained when suitable analytical techniques are applied to an appropriate age adjusted indicator of TMFR hence a presentation of the following chapter on decomposition results.

CHAPTER 6 : DECOMPOSITION OF CHANGES IN MARITAL FERTILITY LEVELS

6.1. Introduction

The main objective of this research was to apply decomposition method to the study of the drivers of marital fertility transitions in the SSA context using the cases of Ghana, Kenya, Rwanda and Zimbabwe. The focus on marital fertility was predicated on a two-tier rationale. Firstly, marital fertility accounts for the largest component of overall fertility levels in SSA especially when perceived from an historical perspective of fertility transitions. Lastly, integral to the general objective of the study was to understand the extent to which men in the context of patriarchal sociocultural and economic contexts of SSA have influenced changes in countries' fertility rates. The purpose of this chapter is to present results from decomposition analysis performed on the DHS data from Ghana, Kenya, Rwanda and Zimbabwe. The first section deals with the aggregate conditional percentage contributions of changes in characteristics, coefficients and interactions to observed inter-survey changes in the average ASMFRs. This is followed by the section on the respective conditional contributions of proximate determinants of marital fertility changes and in turn sections on results for female variables, male variables, demographic and finally socioeconomic and geographic variables.

6.2. Aggregate conditional contributions of endowments, coefficients and interaction

The decomposition of the temporal change in the average of ASMFRs using the Oaxaca-Blinder technique partitioned the difference in the levels of the fertility indicator into three components classified as endowments, coefficients and interaction. These three components were estimated as conditional contributions. This means that the estimated percentages for each aggregate component reflect the extent to which the mean ASMFR would increase or decrease if a population experienced a change in the respective component alone while remaining

unchanged in the other components. This section presents these conditional contributions of the three Oaxaca-Blinder decomposition components in percentages. There are four Figures from 6.1 to 6.4 below which show the aggregate decomposition results for each country for all the inter-survey periods available. To facilitate easy interpretation of the Figures, Table 6.1 is presented first showing three-year point estimates of the average ASMFRs for each survey from Ghana, Kenya, Rwanda and Zimbabwe. These estimates are the indicators of marital fertility rates per survey from which all the decomposition analyses were based.

Table 6.1: Point estimates of the average ASMFRs

	Period 1		**Period 2**		**Period 3**		**Period 4**		**Period 5**	
	DHS-1	**DHS-2**	**DHS-1**	**DHS-2**	**DHS-1**	**DHS-2**	**DHS-1**	**DHS-2**	**DHS-1**	**DHS-2**
Ghana	0.247	0.203	0.203	0.176	0.176	0.180	0.180	0.168	0.168	0.179
Kenya	0.254	0.218	0.218	0.194	0.194	0.209	0.209	0.193	0.193	0.165
Rwanda			0.264	0.271	0.271	0.286	0.286	0.208	0.208	0.185
Zimbabwe	0.209	0.177	0.177	0.155	0.155	0.151	0.151	0.161	0.161	0.170

The average ASMFRs reported in Table 6.1 above were obtained from the decomposition output and corresponded with those computed for the reconstruction of the trends presented in Chapter 4. The respective surveys represented by DHS-1 and DHS-2 columns are stated in the graphs showing the decomposition results for the respective periods. The DHS-2 for a preceding period was the DHS-1 for the succeeding period and the repetition of the average ASMFRs indicate that the same fertility estimate of each survey wase analysed irrespective of a period. To understand the significance of the contents of Table 61 and the interpretation of the decomposition results, one needs to understand the process of deriving the percentages reported in the Figures below as well as the meaning of positive and negative signs of the percentages. The percentage change in the average ASMFRs (gold bars in Figures 6.1-6.4 below) were obtained by expressing the differences between DHS-1 and DHS-2 as a percentage-points gap from the DHS-1 estimate. For example, the average ASMFR estimates

for Ghana's period 1 were 0.247 (GDHS1988) and 0.203 (GDHS1993) yielding a difference of 0.044;

$$\Delta_{\overline{ASMFRs}} = 0.247 - 0.203 = 0.044.$$

Expressing the difference as a percentage-points gap from the estimate for the base survey (GDHS1988) shows that the level of ASMFRs declined by 17.8 percentage-points for period 1;

$$\%\Delta_{\overline{ASMFRs}} = \frac{0.044}{0.247} * 100 = 17.8.$$

This means that the level of the average ASMFRs for Ghana declined by 17.8 percentage-points from 1988 to 1993. This process of estimating the gap reflecting the magnitude of change in the level of the mean of ASMFRs leads to the issue of positive and negative percentage-points. In this study, positive percentage-points indicate decline in the mean of ASMFRs while negative percentage-points reflect inter-survey increase in the average of marital fertility rates. With regards to the decomposition results of the endowments, coefficients and interaction, a component whose coefficient shares the same positive sign with the coefficient for the differences in average ASMFRs contributed to the decline in fertility. Meanwhile, a component sharing the same negative sign as the coefficient for differences in the mean of ASMFRs imply that the decomposition component contributed to the increase (stalling) of marital fertility rates. For the instances where coefficients of the components had a different sign from that of the coefficient for difference, it means that the impact of that component acted to reverse the observed change in the level of ASMFRs. Such instances are explained as encountered in the chapter.

The aggregate results for Ghana show that coefficients played a major role in the inter-survey changes in the levels of the average ASMFRs for all the five periods [Figure 6.1].

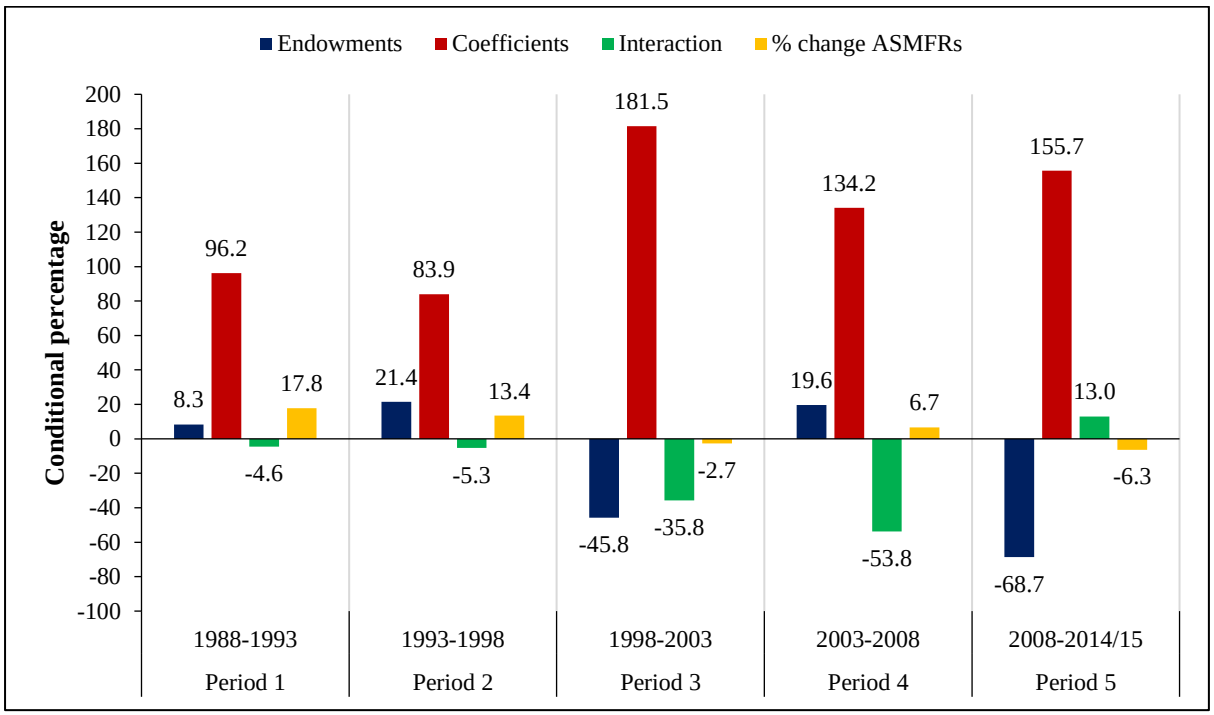


Figure 6.1: Aggregate decomposition results for five periods in Ghana, DHS 1988-2014/15

As shown in Figure 6.1 above, the first period involving the GDHS1988 and GDHS1993 surveys had a 17.8 percentage-points decrease in the mean ASMFR from 0.0247 to 0.203. The major contribution to the decline appears to be the reduction in the fertility returns to characteristics. Based on the results in Figure 6.1, if the GDHS1988-GDHS1993 inter-survey period experienced changes in coefficients alone with endowments at the GDHS1988 levels while removing the interaction, the magnitude of decline in the average ASMFR would have been greater than the 17.8 percentage-points by 96.2%. The same interpretation holds for endowments; if coefficients had remained at the GDHS1988 levels while removing the interaction between the two surveys, the extent of the decline in the mean ASMFR for Ghana's period 1 would have been greater than the 17.8 percentage-points by 8.3%. The interaction term (-4.6%) of the decomposition, which measures the fact that the differences in the

endowments and coefficients of the GDHS1988 and GDHS1993 exist simultaneously in the two surveys, accounts for a component of the decline in the mean of ASMFRs that may not be accounted for by the examined endowments and their coefficients. This was however not significant for Ghana's period 1 because the conditional contribution of the interaction was minimal such that removing the role of endowments and coefficients would not have resulted in a magnitude of decline that was different from the observed 17.8 percentage [$\frac{-4.6}{100} * 17.8 + 17.8 = 16.98$].

The results reported in Figure 6.1 show that the change in coefficients between the GDHS1988 and GDHS1993 had the largest conditional contribution to the decrease in the mean of ASMFRs for Ghana's period 1. This highlights the potential of the changes in coefficients to effect greater marital fertility decline in Ghana. The large positive conditional percentage contribution of the coefficients also suggests that all segments of the Ghana population, for example, across education statuses experienced declines in ASMFRs between the 1988 and 1993 GDHS surveys. The endowments changes in the form of shifts towards greater membership in the segments of the population associated with lower fertility produced a small conditional percentage contribution of 8.3%. This can be interpreted as implying that the observed 17.8 percentage-points decrease in the mean ASMFR for Ghana was arguably consistent with the compositional changes in the samples of the GDHS1988 and GDHS1993. The endowments effect measures the role of socioeconomic, cultural and political transformations in a country which result in more people having higher educational attainment, improved household wealth, delayed marriages and adoption of abortion as well as birth control services among others.

The magnitude of the decrease in the mean of ASMFRs for period 2 involving GDHS1993 and GDHS1998 was equivalent to 13.4 percentage-points, the average ASMFR falling from 0.203 to 0.176. Nonetheless, it was a statistically significant decline at the 5% level. The major contribution to this decline was the reduction in effects of endowments (coefficients) although the conditional impact was less than that for period 1. Meanwhile, the conditional contribution of the endowments more than doubled in period 2 from the size observed in period 1.The changes in endowments alone between the 1993 and 1998 GDHS surveys would have led to a decrease in the mean of the ASMFRs equivalent to a margin higher than the observed 13.4 percentage-points by 21.4%. This means that removing the role of coefficients and interaction in period 2, the mean ASMFR for Ghana would have declined by 16.3 percentage-points between the GDHS1993 and GDHS1998. The impact of changes in coefficients alone while holding constant endowments and interaction would have led to a magnitude of decline in the mean ASMFR that was 83.9% greater than the observed 13.4 percentage-points. This means that the mean ASMFRs for Ghana's period 2 would decline by 24.6 percentage-points if the period was characterised by changes in coefficients alone [$\frac{83.9}{100} * 13.4 + 13.4 = 24.6$]. Just like for period 1, the conditional contribution of the interaction was minimal in period 2 and would not have resulted in a decline in the mean of ASMFRs that was different from the observed 13.4 percentage-points.

The third inter-survey period for Ghana which involved the GDHS1998 and GDHS2003 was characterised by lack of downward change in the mean of ASMFRs. The average ASMFRs instead increased by 2.7 percentage-points from 0.176 in the GDHS1998 to 0.180 in the GDHS2003. This apparent stalling of marital fertility transition was to an extent caused by compositional changes in the population. These compositional changes resulted in greater

proportions of married women enumerated in the GDHS2003 being found in the segments of the sample that were associated with higher ASMFRs compared to the sample distribution of the GDHS1998. If period 3 involved changes in only the compositional features of the married population in Ghana, the magnitude of increase in the mean of ASMFRs would have been greater than the observed 2.7 percentage-points by 45.8%. This means that the mean ASMFRs for Ghana would have increased by 4 percentage-points [$\frac{45.8}{100} * 2.7 + 2.7 = 4.0$]. Considering the interaction alone for period 3 while holding constant the endowments and coefficients was going to lead to an increase in the average of ASMFRs by 3.7 percentage-points instead of the observed 2.7 [$\frac{35.8}{100} * 2.7 + 2.7 = 3.7$]. Meanwhile, the changes in coefficients between the 1998 and 2003 GDHS surveys favoured a decline in marital fertility. Based on the results reported in Figure 8.1, the mean of ASMFRs for Ghana's period 3 would have declined by 7.6 percentage-points [$\frac{181.5}{100} * 2.7 + 2.7 = 7.6$] if the 1998 and 2003 GDHS surveys were differentiated by coefficients alone. The stalling of marital fertility transition between the 1998 and 2003 GDHS surveys was thus influenced by endowments and interaction.

The fourth inter-survey period for Ghana which involved the GDHS2003 and GDHS2008 was marked by a 6.7 percentage-points decline of the mean of ASMFRs from 0.180 to 0.168. Based on the results shown in Figure 6.1, this decline in the mean of ASMFRs was influenced by conducive changes in endowments and coefficients. The change in endowments alone would however not have resulted in a magnitude of decline that was significantly greater than the observed 6.7 percentage-points. Meanwhile, the conditional contribution of coefficients would have led to a significantly greater magnitude of decline in the mean of ASMFRs between the GDHS2003 and GDHS2008. Ghana's period 4 involved surveys that showed considerable differences in endowments and coefficients as reflected by a larger interaction than in any other

period. Allowing for only the simultaneous existence of the differences in endowments and coefficients between the GDHS2003 and GDHS2008 without considering temporal changes in endowments and coefficients would have perpetuated stalling of marital fertility transition into Ghana's period 4. The conditional percentage contribution of the interaction thus contributed towards reducing the magnitude of decline in the means of ASMFRs between the 2003 and 2008 GDHS surveys.

The fifth period for Ghana involving the GDHS2008 and GDHS2014-15 signified what can be interpreted as a reoccurrence of inter-survey stalling of marital fertility transition. Period 5 saw the mean of ASMFRs increase by 6.3 percentage-points from 0.168 in the GDHS2008 to 0.179 in the GDHS2014-15. This stalling of marital fertility transition was influenced in part by unfavourable compositional changes. This happens when a higher proportion of married women are found in segments of the population associated with higher fertility rates in the GDHS2014-15 than in the GDHS2008. The endowments effect offset the force of coefficients. The results shown in Figure 8.1 imply that if coefficients were the only change for Ghana's period 5, the mean of ASMFRs would have continued to decline in period 5 relative to period 4 levels.

The aggregate results for Kenya showed greater impact of coefficients than endowments for all the five periods although both played an important role the marital fertility transition of the country. The results are presented in Figure 6.2 below.

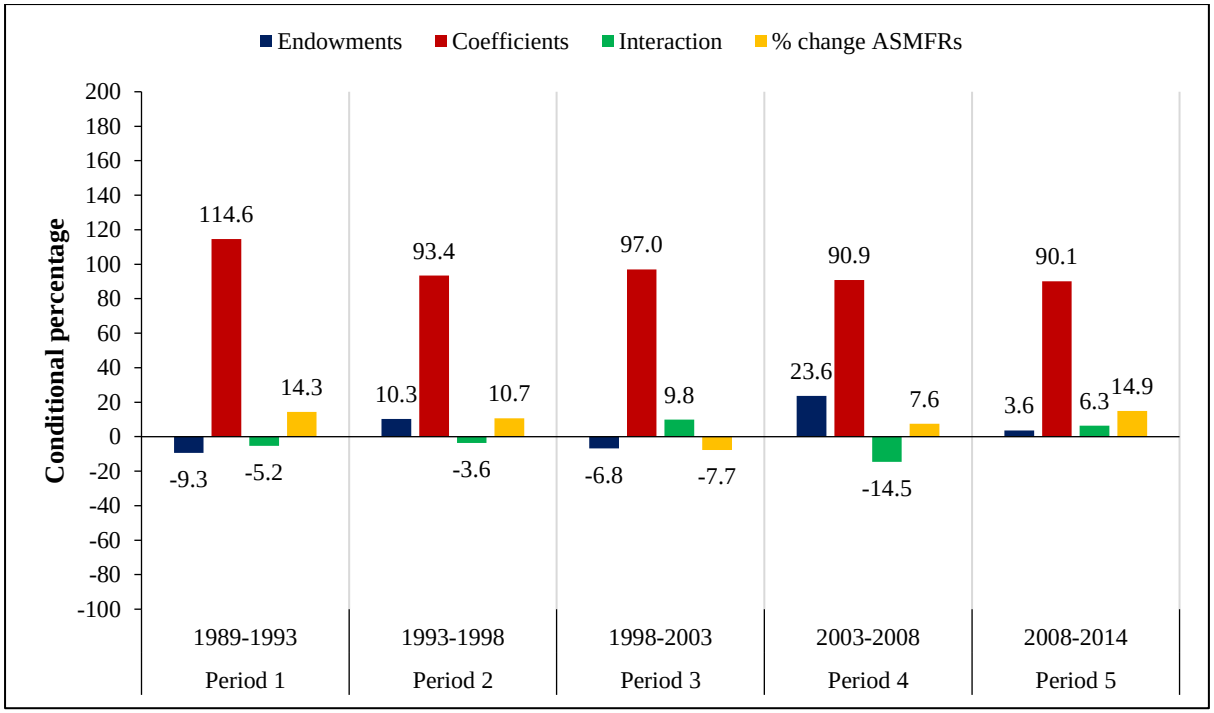


Figure 6.2: Aggregate decomposition results for five periods in Kenya, DHS 1989-2014

The first period for Kenya involving KDHS1989 and KDHS1993 saw a decrease in the mean ASMFRs of14.3 percentage-points from 0.254 to 0.218. This decline was virtually influenced by coefficients, implying that all segments of the married population in Kenya experienced lower fertility in the KDHS1993 than in the KDHS1989. Based on the results shown in Figure 6.2, a change in coefficients alone in period 1 would have seen the decrease in the average of ASMFRs of 30.7 percentage-points [$\frac{114.6}{100} * 14.3 + 14.3 = 30.7$]. The failure of marital fertility rates to decline by the conditional magnitude of 30.7 percentage-points was because of unfavourable compositional changes and interaction which acted to reverse fertility transition. The conditional percentage contributions of endowments and interaction were however minimal and not large enough to prevent the onset of marital fertility transition in Kenya.

The second inter-survey period for Kenya saw the mean of ASMFRs decline by 10.7 percentage-points from 0.218 in the KDHS1993 to 0.194 in the KDHS1998. The contributions

to this decline came from favourable temporal changes in endowments and coefficients with the latter returning greater conditional impact. Based on the results depicted in Figure 6.2 above, allowing for change in either endowments or coefficients only would have resulted in greater magnitude of decline. For instance, change in endowments alone while holding constant coefficients and interaction would have resulted in a magnitude of fertility decline that was 10.3% greater than the observed 10.7 percentage-points. Meanwhile, the magnitude of marital fertility decline that would have prevailed if only coefficients were the difference between the 1993 and 1998 KDHS surveys would have been 93.4% greater than 10.7 percentage-points.

Following the two inter-survey periods characterised by marital fertility decline in Kenya was the third period which was marked by increase in the mean of ASMFRs. Period 3 for Kenya saw the mean of ASMFRs increase by 7.7 percentage-points from 0.194 in the KDHS1998 to 0.209 in the KDHS2003. This increase in the average of ASMFRs was arguably due to coefficients. The results shown in Figure 8.2 imply that changes in coefficients acted to support stalling of marital fertility transition. In the absence of changes in endowments and controlling for interaction, the average ASMFR would have increased by 15.2 percentage-points [$\frac{97.0}{100} * 7.7 + 7.7 = 15.2$]. It should be noted that when computing the expected magnitude of increase conditional on changes in coefficients only, the negative sign of observed 7.7 percentage-points increase is ignored. The significance of the negative sign is not its mathematical implication but simply direction of change in the mean of ASMFRs depending on which survey was the base survey. The changes in the compositional characteristics of the married sample for Kenya's period 3 favoured marital fertility decline although not by a significant margin. The results for Kenya's period 3 thus imply that the stalling of the inter-survey decline of ASMFRs was influenced by unfavourable changes in coefficients. Coefficients cause temporal increase

in fertility when all segments of the sample experience lack decrease in fertility returns. In other instances, if a dominant segment of the sample in terms of absolute size experiences temporal increase or lack of decrease in fertility rates, the result can also be stalling of fertility transition.

There was resumption of inter-survey decline of marital fertility rates in the fourth period in Kenya. The mean of ASMFRs decreased from 0.209 in the KDHS2003 to 0.193 in the KDHS2008, a 7.6 percentage-points decrease. Both endowment and coefficients contributed to this decrease with the latter potentially having a greater impact. The extent of the decrease in fertility conditional on Kenya's period 4 experiencing changes in coefficients only would have been 90.9% greater than the 7.6 percentage-points that prevailed. This means that the average of ASMFRs was going to decrease by 14.5 percentage-points if the 2003 and 2008 KDHS surveys were differentiated by coefficients only [$\frac{90.9}{100} * 7.6 + 7.6 = 14.5$]. In the event that the KDHS2008 was differentiated from the KDHS2003 by endowments only, the mean of ASMFRs would have decreased by 9.4 percentage-points [$\frac{23.6}{100} * 7.6 + 7.6 = 9.4$]. The presents of a considerable interaction (14.5%) contributed to ensuring that the average of ASMFRs did not decline by more than 7.6 percentage-points between the 2003 and 2008 KDHS surveys.

The last inter-survey period for Kenya registered the largest decrease in the mean estimate of ASMFRs. Between the two surveys involved, the average ASMFRs decreased by 14.9 percentage-points from 0.193 in the KDHS2008 to 0.165 in the KDHS2014. The results presented in Figure 8.2 show that all the decomposition components contributed to this decline. The change in coefficients had the largest conditional contribution while those of endowments

and interaction were relatively minimal. If Kenya's period 5 was characterised by changes in coefficients alone, the mean ASMFR was going to decrease by 28.3 percentage-points [$\frac{90.1}{100} * 14.9 + 14.9 = 28.3$]. The extent of decrease in the mean of ASMFRs conditional on period 5 experiencing endowments changes only would be 15.4 percentage-points [$\frac{3.6}{100} * 14.9 + 14.9 = 15.4$]. Kenya's period 5 had the largest magnitude of fertility decline compared to all the other periods and this was partly due to the fact that all the decomposition components (endowments, coefficients and interaction) operated to support fertility decrease. The overall picture for Kenya suggests a decrease of the conditional contributions of coefficients over time.

The aggregate results from the decomposition analysis of Rwanda's DHS data showed greater conditional contributions of coefficients compared to endowments and interaction just like in Ghana and Kenya as already shown. There was no survey for Rwanda collected during phase 1 of DHS. Consequently, period 1 for Rwanda involved surveys collected in the post-1990 period unlike for the other countries where pre-1990 surveys are available. The results for Rwanda showed a unique pattern compared to the other countries in that the country experienced two successive periods of increases in the mean of ASMFRs. As shown in Figure 8.3 below, the RDHS1992-RDHS2000 inter-survey period saw the mean of ASMFRs for Rwanda increase by 3.3 percentage-points.

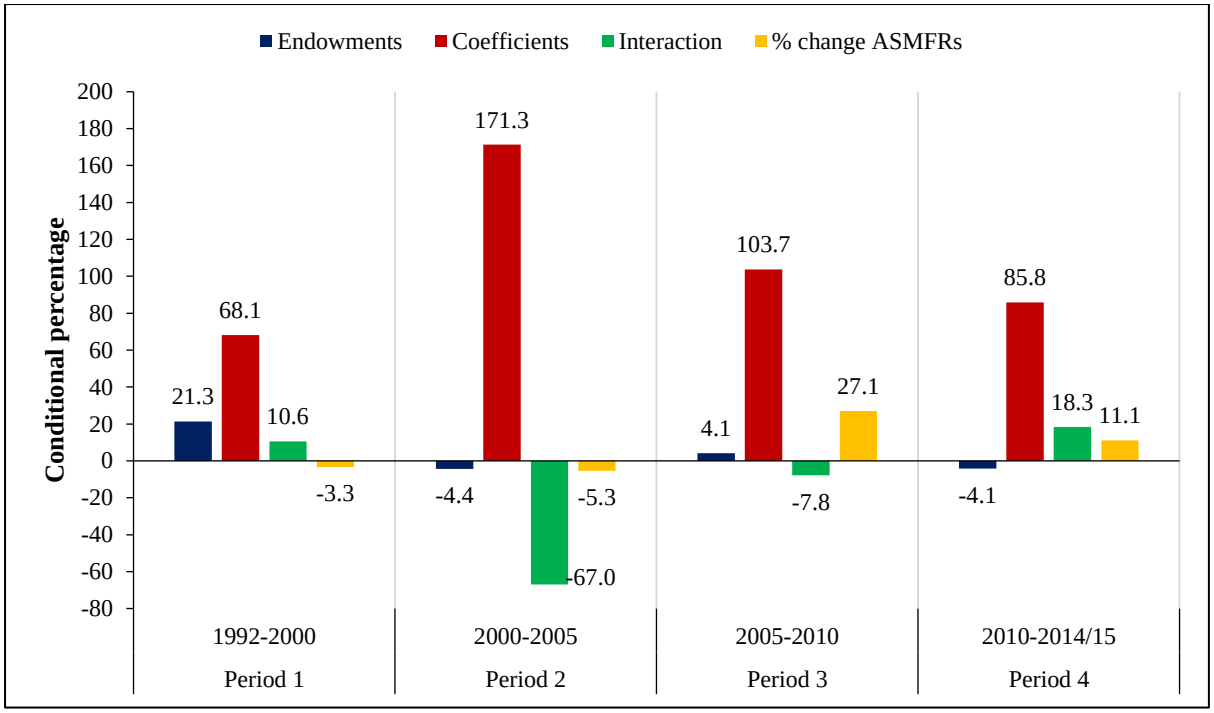


Figure 6.3: Aggregate decomposition results for four periods in Rwanda, DHS 1992-2014/15

The results for period 1 mean that the endowments, coefficients and the interaction contributed to the increase in marital fertility for Rwanda in the nineties decade. The largest conditional percentage change in the mean of ASMFRs for Rwanda between the RDHS1992 and RDHS2000 was contributed by coefficients. If the only change between these surveys were coefficients, the increase in the mean of ASMFRs would have been 5.5 percentage-points instead of the observed 3.3 percentage-points [$\frac{68.1}{100} * 3.3 + 3.3 = 5.5$]. Using the same computational approach, the magnitude of increase in the mean ASMFR conditional on changes in endowments only would have been 4.0 percentage-points. Meanwhile, the difference in the RDHS1992 and RDHS2000 when endowments and coefficients were held constant would have been associated with an upward shift in the mean rate of marital fertility for Rwanda. This would however not have been by a margin significantly different from the observed 3.3 percentage-points.

Rwanda's period 2 was characterised by a bigger upward shift in the mean of ASMFRs than that observed for period 1 especially considering that the time span for the latter was considerably longer. The second inter-survey period involved the RDHS2000 and RDHS2005 and saw an increase in the average ASMFR by 5.3 percentage-points. While the increase for period 1 was a result of changes in all the components of the decomposition, that for period 2 was arguably a result of changes in coefficients. This is because endowments effect and the interaction for period 2 would have caused a decrease in marital fertility if coefficients were to be held constant. Based on the results in Figure 8.3, the average ASMFR for Rwanda was going to increase by 14.4 percentage-points between RDHS2000 and RDHS2005 if the only change for this period occurred in coefficients [$\frac{171.3}{100} * 5.3 + 5.3 = 14.4$]. If the differences between the two surveys involved in period 2 were accounted for by interaction only, the mean ASMFR would have increased by less than 2 percentage-points [$\frac{-67.0}{100} * 5.3 + 5.3 = 1.7$]. There were no compositional changes in Rwanda's period 2 that would have caused marital fertility to change by a margin different from the observed 5.3 percentage-point if coefficients and interaction were held constant.

While the first two inter-survey periods for Rwanda were characterised by marital fertility increases, the last two showed sharp decreases. In period 4, the mean ASMFR decreased by 27.1 percentage-points and this was the largest magnitude of fertility change ever experienced for a single inter-survey period in all the countries examined. The major contribution to this significant marital fertility decrease came from coefficients as signified by the large conditional percentage contribution indicated in Figure 8.3. If Rwanda experienced changes in coefficients alone for period 4, the magnitude of fertility decrease between RDHS2005 and RDHS2010 was going to be 55.2 percentage-points [$\frac{103.7}{100} * 27.1 + 27.1 = 55.2$]. The endowments effect

for period 4 also favoured fertility decrease although the conditional contribution was minimal while the interaction alone would have seen marital fertility increase. There was a different picture regarding to how the threefold decomposition components would have affected fertility change for Rwanda's period 5. While endowments and coefficients favoured fertility decrease in the preceding period 4, it was coefficients and the interaction that operated to support decrease in marital fertility for period 5. Between the RDHS2010 and RDHS2014/15, the mean ASMFR for Rwanda decreased by 11.1 percentage-points. Conditional on changes in coefficients alone, the magnitude of decrease was going to be 85.8% greater than the observed 11.1 percentage-points. This means that the mean ASMFR for Rwanda was to decrease by 20.6 percentage-points. If the surveys involved for period 5 were subject to the interaction term alone, the extent of decrease in the mean ASMFR was going to the 13.1 percentage-points. Looking at the entire period covered by DHS data, it can be concluded that the sources of fertility change in Rwanda were not constant over time, but endowments and coefficients were important in driving the temporal increases and decreases in marital fertility.

The decomposition results for Zimbabwe highlighted greater conditional contributions of coefficients than endowments and interaction for all the five inter-survey periods, a picture related to the situations of Ghana, Kenya and Rwanda. There were however unique features of the results for Zimbabwe as was the case with each of the other three countries. For instance, Zimbabwe was the only country to have the largest decrease in the mean rate of ASMFRs occurring in the first inter-survey period. As shown in Figure 6.4 below, Zimbabwe's first period which involved the ZDHS1988 and ZDHS1994 had a 15.4 percentage-points decrease in the mean ASMFR having fallen from 0.209 to 0.177. This decrease in the mean ASMFR was arguably influenced by favourable changes in coefficients. The results in Figure 8.4 show that the conditional contribution of coefficients was positive while those of endowments and

interaction were negative. This means that in the absence of the downward shifts in coefficients, the mean ASMFR would have barely changed between the ZDHS1988 and ZDHS1994. Meanwhile, if period 1 was characterised by changes in coefficients alone, Zimbabwe was going to experience a decrease in the mean ASMFR of 31.6 percentage-points [$\frac{105.4}{100} * 15.4 + 15.4 = 31.6$].

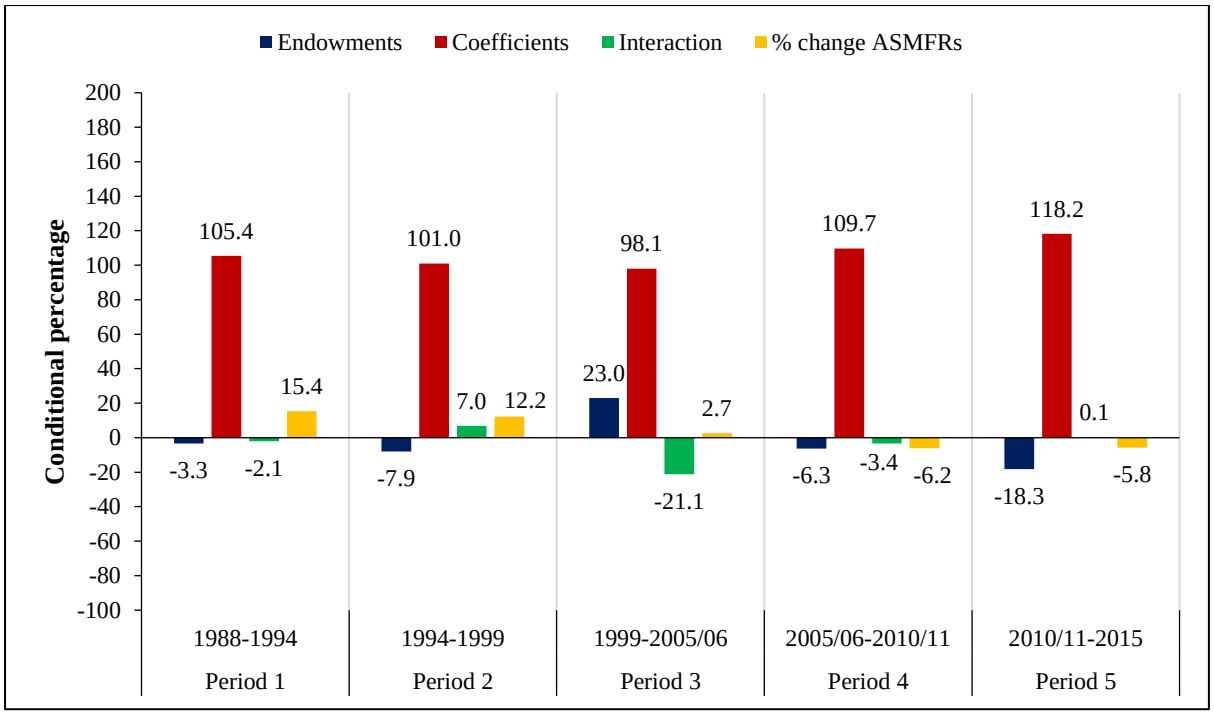


Figure 6.4: Aggregate decomposition results for five periods in Zimbabwe, DHS 1988-2015

The inter-survey decreases in the mean rate of ASMFRs continued in period 2 which involved the ZDHS1994 and ZDHS1999 albeit with a slightly smaller magnitude than that for period 1. Between the 1994 and 1999 ZDHS surveys, the mean ASMFR for Zimbabwe decreased by 12.2 percentage-points. This decrease was pushed by coefficients and to a less extent the interaction while changes in compositional characteristics of the married sample operated to reverse the downward shift in marital fertility. Based on the results reported in Figure 6.4, holding constant compositional changes and removing the effect of interaction would have seen

the magnitude of decrease in the mean ASMFR that was greater than the observed 12.2 percentage-points by 101%. Following the already demonstrated computational procedure for obtaining the conditional magnitude of fertility decrease, 101% implies that the mean ASMFR for Zimbabwe would have decreased by 24.5 percentage-points.

The significant inter-survey decreases in the mean ASMFRs that prevailed in the first two periods for Zimbabwe dissipated in period 3. The mean ASMFR barely changed between the ZDHS1999 and the ZDHS2005-06. A considerable amount of interaction (21.1%) existed between these two surveys involved for period 3, perhaps reflecting the differences in the macro environments of Zimbabwe that prevailed in the 1990s and noughties decade. Zimbabwe's period 3 represented the first instance of inter-survey stalling of marital fertility transition as marital fertility failed to decline post-1999, a culmination of the diminishing fertility inhibiting effects of changes in coefficients inasmuch as these were responsible for most of the fertility decline in the country.

While Zimbabwe's period 3 stood out for being the first to post an insignificant decrease in the mean ASMFR, period 4 which involved the ZDHS2005-06 and ZDHS2010-11 surveys was the first inter-survey period to be characterised by increase in marital fertility rates. The average rate of ASMFRs for Zimbabwe increased by 6.2 percentage-points in period 4. This increase in marital fertility passed statistical test of significance at the 95% level of confidence. The component that played a significant role in this increase was coefficients given the large conditional percentage contribution of 109.7%. The conditional percentage contributions of endowments (-6.3%) and interaction (-3.4) imply that these components operated to reverse the observed direction of change in the marital fertility rate, but their collective impact was too

small to offset that of coefficients. Nonetheless, endowments and interaction contributed to curbing an increase in the mean ASMFR of more than 12 percentage-points. This is because in the absence of the endowments effect and interaction, the magnitude of increase in the mean ASMFR was going exceed 13 percentage-points.

Period 5 for Zimbabwe saw a continuation of inter-survey increase in the marital fertility rate which started in period 4. As shown in Figure 6.4 above, the mean ASMFR for Zimbabwe increased by a statistically significant 5.8 percentage-points from 0.161 in the ZDHS2010-11 to 0.170 in the ZDHS2015. As was the case for the preceding period, this increase was entirely driven by changes in fertility returns to characteristics. If Zimbabwe experienced changes in coefficients only, the magnitude of fertility increase was going to be greater than 5.8 percentage-points by 118.2%. The impact of compositional changes, which was greater in period 5 than period 4, contributed to holding back marital fertility increase between the ZDHS2010-11 and ZDHS2015. It is worth noting that period 5 involved surveys that were virtually similar as reflected by the almost non-existent interaction (0.1%). This means that the increase in marital fertility rates can be accounted for by coefficients and endowments only. A twofold decomposition would have been sufficient to analyse Zimbabwe's period 5. However, given the existence of considerable interactions in previous periods, threefold decomposition was applied for consistency.

6.3. Detailed decomposition results

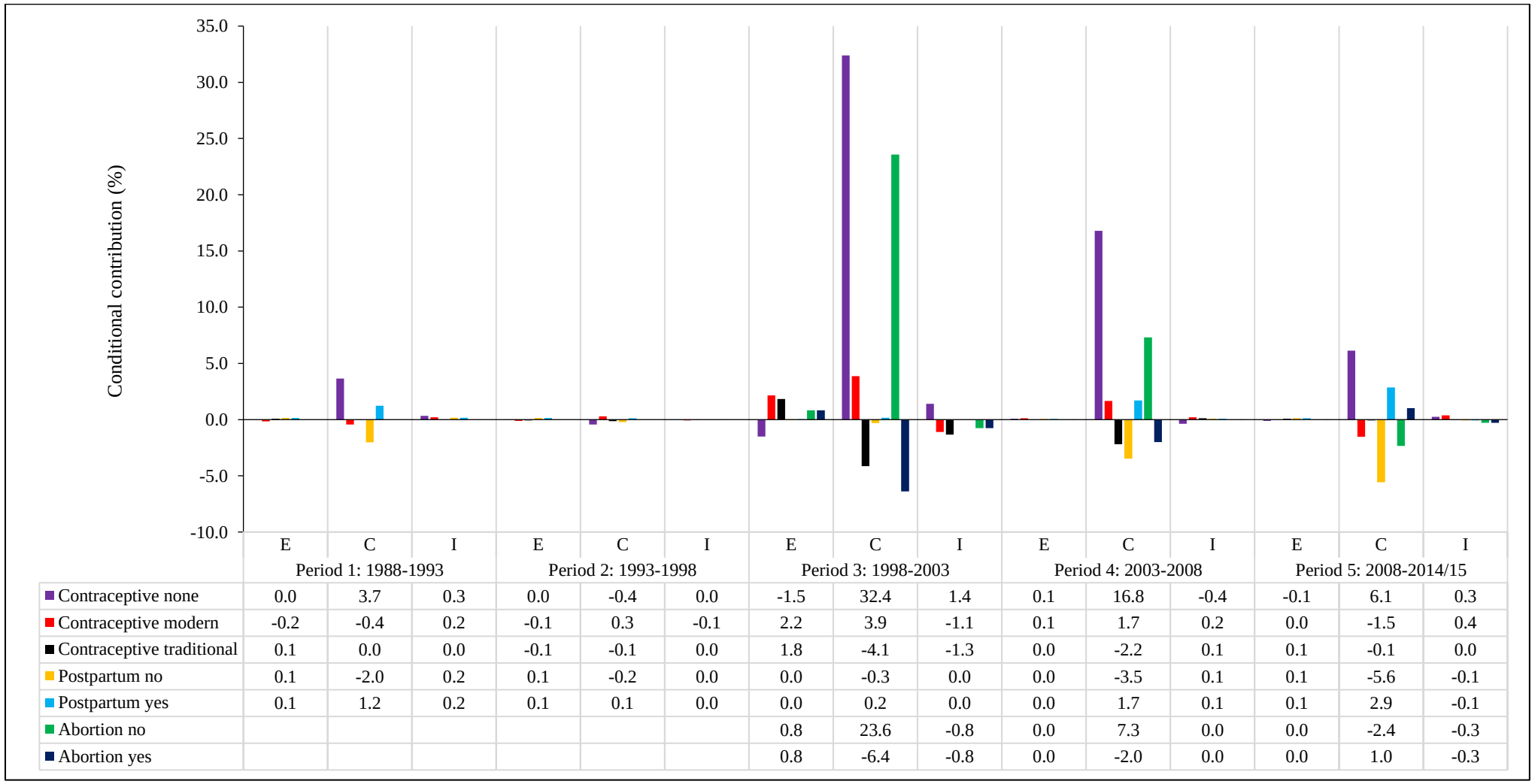
Many studies of fertility have found different factors to be significant determinants of cross-sectional differences in fertility rates among women. However, as highlighted elsewhere in this study in acknowledgement of existing studies like Garenne (2008a), accounting for cross-

sectional variabilities in fertility rates does not imply that a particular variable is a significant predictor of temporal changes in the national-level fertility rates. The detailed results from decomposition analysis thus provide a basis for determining the importance of the respective classes of and individual variables in marital fertility transition. This section thus provided the estimates of each variable's role in driving the temporal changes in the marital fertility rates of Ghana, Kenya, Rwanda and Zimbabwe.

6.3.1 Conditional contributions of the proximate determinants

The regression results obtained from variance components models presented in Chapter 5 proved that proximate factors can be vital determinants of cross-sectional differentials in marital fertility rates. This section provides results on the ability of these proximate factors to explain the temporal shifts in the fertility rates of married women from Ghana, Kenya, Rwanda and Zimbabwe. Starting with Ghana, the results showing the conditional percentage contributions of the proximate determinants to the inter-survey differences in the mean of ASFRs for the successive surveys are presented in Figure 6.5 below.

The results in Figure 6.5 suggest a negligible conditional effect of the proximate factors for Ghana's first two periods. The observed decreases in marital fertility rates for the GDHS1988-GDHS1993 and GDHS1993-GDHS1998 inter-survey periods reported in Figure 6.1 above were consistent with the driving forces of the proximate factors. The results in Figure 6.5 show that neither the endowments nor coefficients of the proximate determinants had any significant conditional effect on the onset of fertility transition in Ghana. The lack of large conditional percentage contributions to the temporal change in fertility implies that the observed change in fertility was consistent with the driving force of the endowments and coefficients effects.

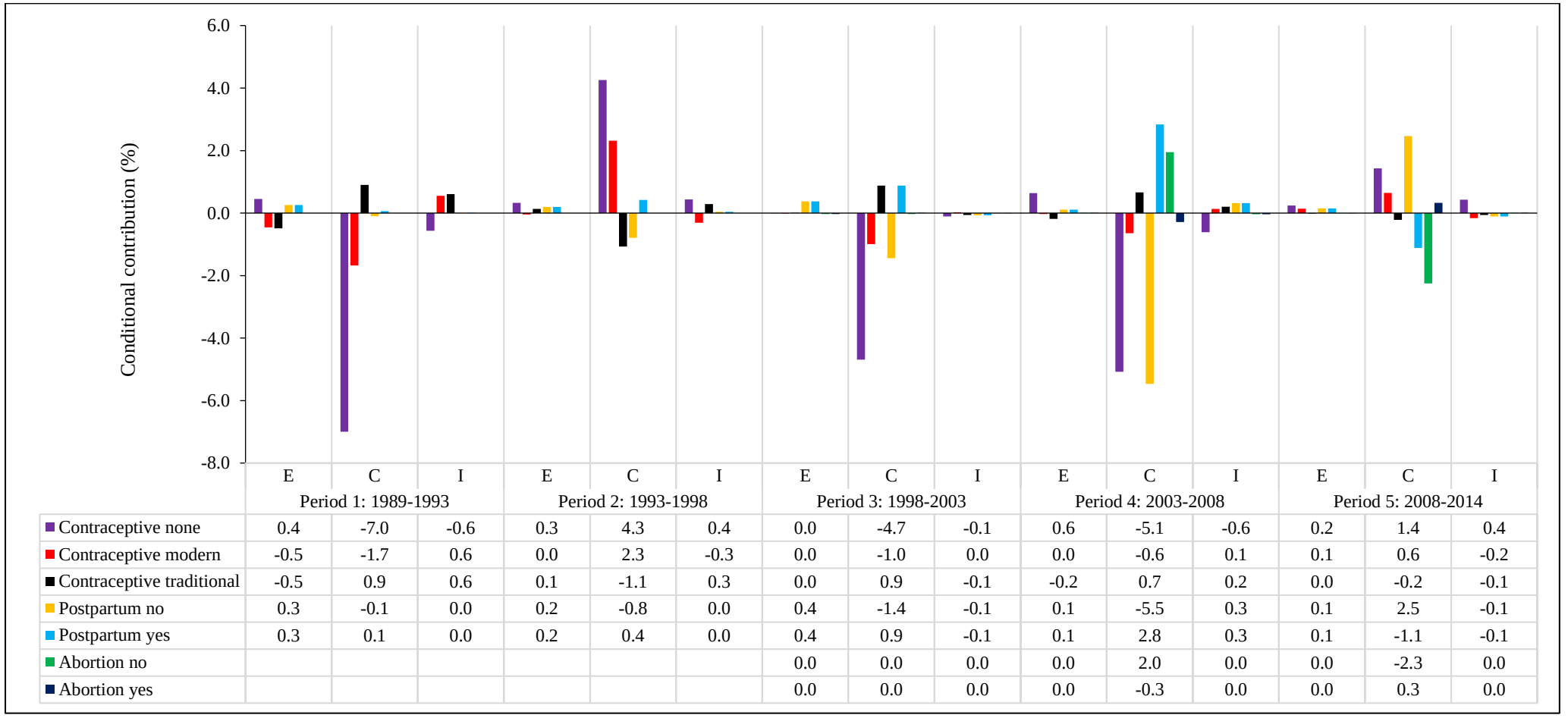


	Period 1: 1988-1993			Period 2: 1993-1998			Period 3: 1998-2003			Period 4: 2003-2008			Period 5: 2008-2014/15		
	E	C	I	E	C	I	E	C	I	E	C	I	E	C	I
Contraceptive none	0.0	3.7	0.3	0.0	-0.4	0.0	-1.5	32.4	1.4	0.1	16.8	-0.4	-0.1	6.1	0.3
Contraceptive modern	-0.2	-0.4	0.2	-0.1	0.3	-0.1	2.2	3.9	-1.1	0.1	1.7	0.2	0.0	-1.5	0.4
Contraceptive traditional	0.1	0.0	0.0	-0.1	-0.1	0.0	1.8	-4.1	-1.3	0.0	-2.2	0.1	0.1	-0.1	0.0
Postpartum no	0.1	-2.0	0.2	0.1	-0.2	0.0	0.0	-0.3	0.0	0.0	-3.5	0.1	0.1	-5.6	-0.1
Postpartum yes	0.1	1.2	0.2	0.1	0.1	0.0	0.0	0.2	0.0	0.0	1.7	0.1	0.1	2.9	-0.1
Abortion no							0.8	23.6	-0.8	0.0	7.3	0.0	0.0	-2.4	-0.3
Abortion yes							0.8	-6.4	-0.8	0.0	-2.0	0.0	0.0	1.0	-0.3

Figure 6.5: Contributions of the proximate determinants to fertility changes in Ghana, DHS surveys 1988-2014/15

There were notable conditional contributions from coefficients associated with none-use of contraceptives and abortion for Ghana's period 3. This period experienced stalling in the form of inter-survey increase in marital fertility from GDHS1998 to GDHS2003. The results reported in Figure 8.5 show that coefficients associated with none users of contraceptives and those who never had an abortion would have caused a greater magnitude of increase in the average ASMFR for Ghana between the 1998 and 2003 GDHS surveys. If there was only change in the coefficients of women who were not using contraceptives or those who had never had an abortion, the magnitude of increase in the mean ASMFR for period 3 would have been greater by 32.4% and 23.6% respectively. The fourth inter-survey period 4 also saw coefficients of non-users of contraceptives and those who never had an abortion having greater conditional impact on fertility change than the other categories of proximate factors. The conditional contributions of these were however subdued compared to period 3 although they supported the decrease in the fertility between the 2003 and 2008 GDHS surveys. There were even reduced conditional contributions to the change in fertility rates for Ghana's period 5 where the mean ASMFR increased between GDHS2008 and GDHS2014. The overall picture of Figure 6.5 is that the driving forces of the proximate determinants were sufficiently reflected in the inter-survey changes in marital fertility rates of Ghana.

The decomposition results for Kenya showed a similar pattern to that of Ghana in terms of coefficients showing greater conditional contributions to fertility change compared to endowments and interaction. As shown in Figure 6.6 below, coefficients associated with women who were not using any contraceptives had greater conditional contributions to fertility change relative to those for the other categories of the proximate factors.



	Period 1: 1989-1993			Period 2: 1993-1998			Period 3: 1998-2003			Period 4: 2003-2008			Period 5: 2008-2014		
	E	C	I	E	C	I	E	C	I	E	C	I	E	C	I
Contraceptive none	0.4	-7.0	-0.6	0.3	4.3	0.4	0.0	-4.7	-0.1	0.6	-5.1	-0.6	0.2	1.4	0.4
Contraceptive modern	-0.5	-1.7	0.6	0.0	2.3	-0.3	0.0	-1.0	0.0	0.0	-0.6	0.1	0.1	0.6	-0.2
Contraceptive traditional	-0.5	0.9	0.6	0.1	-1.1	0.3	0.0	0.9	-0.1	-0.2	0.7	0.2	0.0	-0.2	-0.1
Postpartum no	0.3	-0.1	0.0	0.2	-0.8	0.0	0.4	-1.4	-0.1	0.1	-5.5	0.3	0.1	2.5	-0.1
Postpartum yes	0.3	0.1	0.0	0.2	0.4	0.0	0.4	0.9	-0.1	0.1	2.8	0.3	0.1	-1.1	-0.1
Abortion no							0.0	0.0	0.0	0.0	2.0	0.0	0.0	-2.3	0.0
Abortion yes							0.0	0.0	0.0	0.0	-0.3	0.0	0.0	0.3	0.0

Figure 6.6: Contributions of the proximate determinants to fertility changes in Kenya, DHS surveys 1989-2014

It is worth noting that the detailed conditional contributions of proximate determinants for Kenya's five periods were less than 10% for all periods despite the graph appearing to show the contributions to be more pronounced compared to those observed for Ghana. This means that restricting temporal changes to coefficients only in Kenya for all the periods, the inter-survey decreases and increases in the means of ASMFRs would not be different from those observed and reported in Figure 6.2. The trends in marital fertility rates for Kenya were thus largely consistent with the driving forces of the proximate determinants. The realisation of greater decreases in marital fertility would have been obtained from background factors.

The detailed conditional contributions of proximate determinants to the inter-survey fertility changes in Rwanda were mostly insignificant just like for Ghana and Kenya. The results for Rwanda are presented in Figure 6.7 below. Where proximate determinants appeared to have a notable conditional impact on fertility change, these were in the form of returns to characteristics and not changes in endowments or interaction. It has been shown in chapter 4 that marital fertility rates increased in the first two periods of Rwanda, 1992-2000 and 2000-2005. In both of these periods, the coefficients associated with non-users of contraceptives were in favour of fertility decrease. Nonetheless, the conditional percentages were all below 10%, implying that they would not have altered the direction of temporal increase in marital fertility for Rwanda's first and second inter-survey periods.

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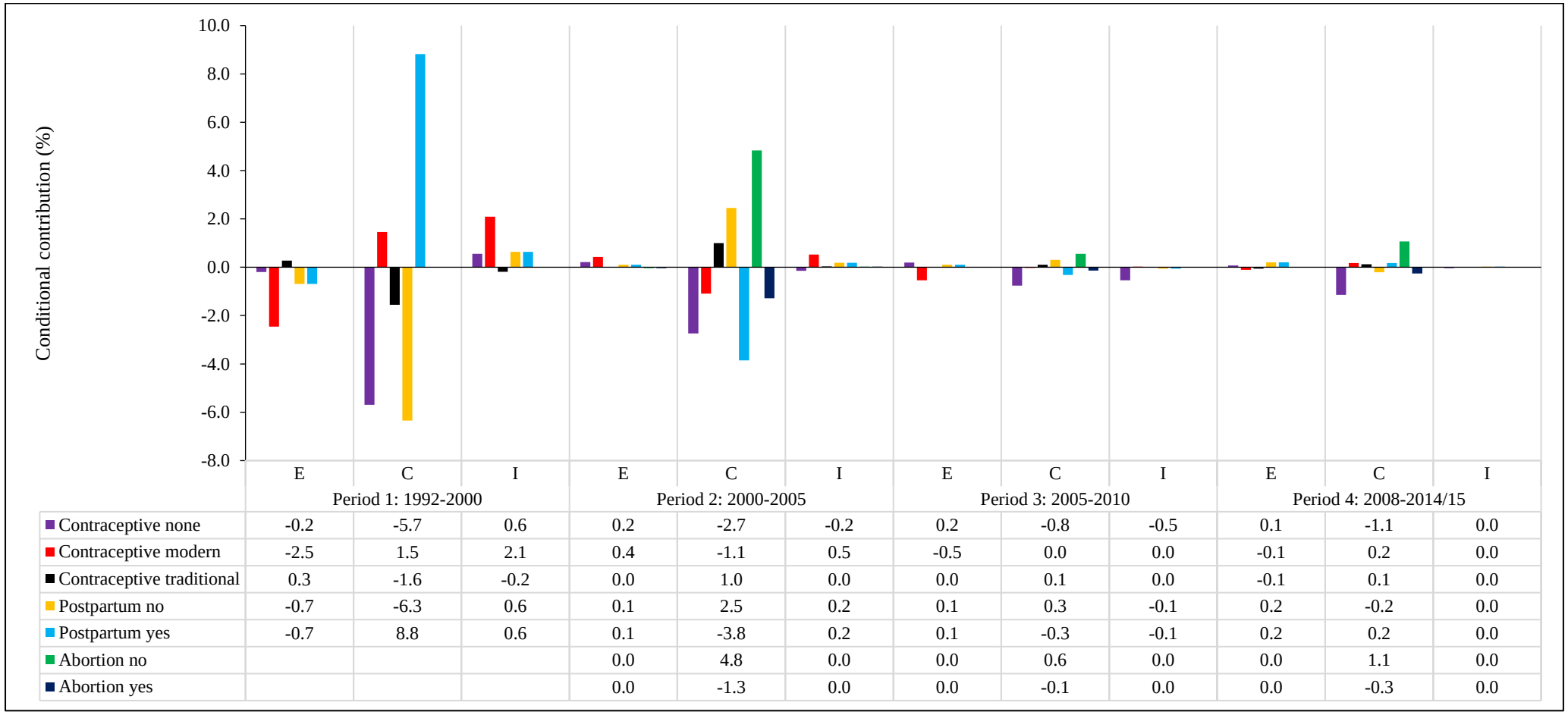
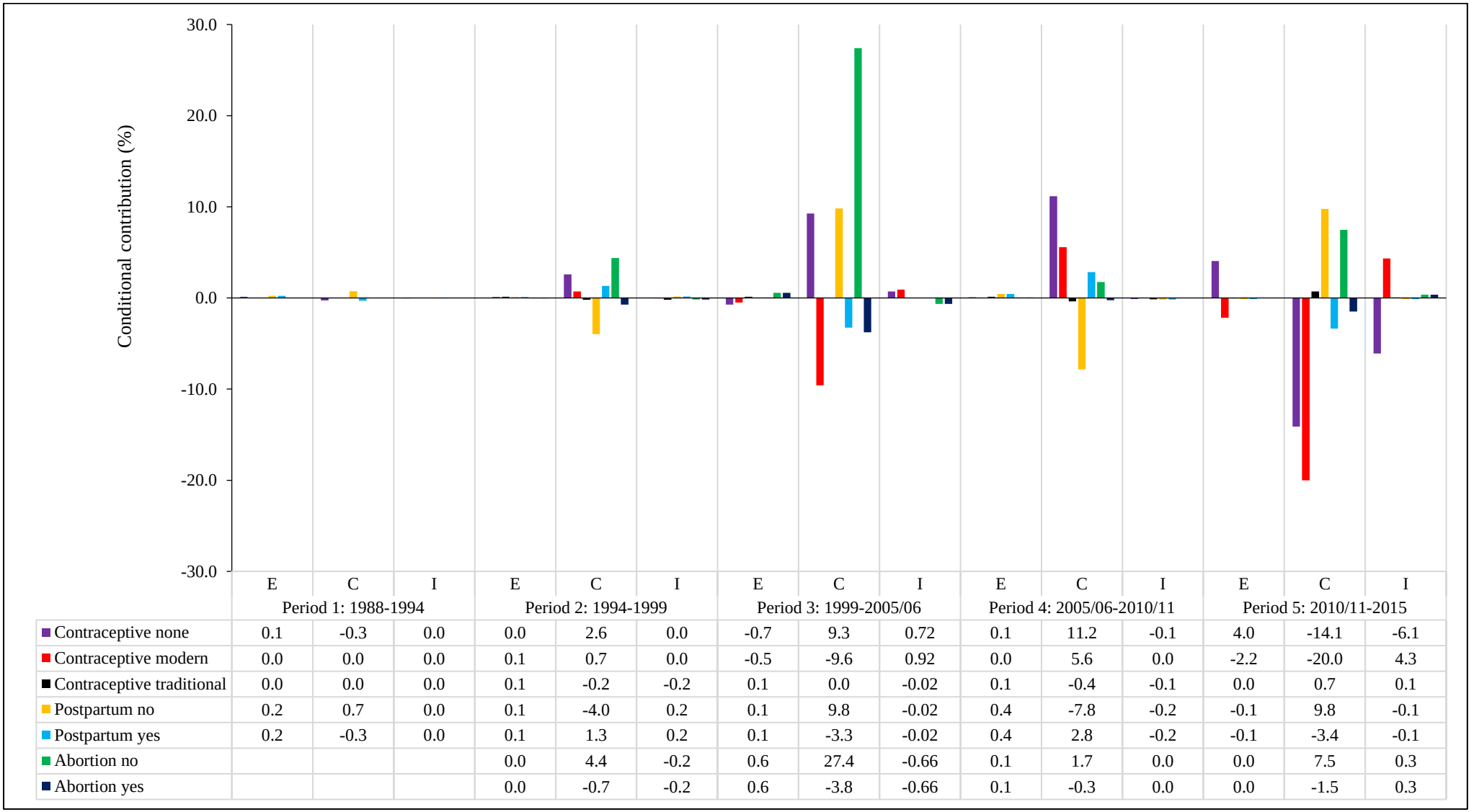


	Period 1: 1992-2000			Period 2: 2000-2005			Period 3: 2005-2010			Period 4: 2008-2014/15		
	E	C	I	E	C	I	E	C	I	E	C	I
Contraceptive none	-0.2	-5.7	0.6	0.2	-2.7	-0.2	0.2	-0.8	-0.5	0.1	-1.1	0.0
Contraceptive modern	-2.5	1.5	2.1	0.4	-1.1	0.5	-0.5	0.0	0.0	-0.1	0.2	0.0
Contraceptive traditional	0.3	-1.6	-0.2	0.0	1.0	0.0	0.0	0.1	0.0	-0.1	0.1	0.0
Postpartum no	-0.7	-6.3	0.6	0.1	2.5	0.2	0.1	0.3	-0.1	0.2	-0.2	0.0
Postpartum yes	-0.7	8.8	0.6	0.1	-3.8	0.2	0.1	-0.3	-0.1	0.2	0.2	0.0
Abortion no				0.0	4.8	0.0	0.0	0.6	0.0	0.0	1.1	0.0
Abortion yes				0.0	-1.3	0.0	0.0	-0.1	0.0	0.0	-0.3	0.0

Figure 6.7: Contributions of the proximate determinants to fertility changes in Rwanda, DHS surveys 1992-2014/15

The conditional contributions of changes in endowments, coefficients and interaction were close to zero in the last two periods for Rwanda. These periods, the RDHS2005-RDHS2010 and RDHS2008-RDHS2014/15, were characterised by significant decreases in marital fertility rates as was shown in chapter 4. The results reported in Figure 6.7 however, imply that the rapid decline in marital fertility was largely consistent with the driving forces of the proximate determinants. The changes in the distribution of the samples did not yield notable conditional percentage contributions of the endowments, suggesting that most of the endowments effect of the proximate factors was consistent with the magnitude of temporal changes in marital fertility observed in Rwanda.

The detailed results from decomposition analysis for Zimbabwe showed a similar temporal outlook as that observed for Ghana in the potential role of proximate determinants starting in the third inter-survey period. In the first period which involved the ZDHS1988 and ZDHS1994, the endowments and coefficients of the proximate determinants were virtually all reflected in the observed decrease in marital fertility. The second period involving the 1994 and 1999 ZDHS surveys showed the emergence of observable conditional percentage contributions of coefficients associated with proximate determinants but were all less than 5% and statistically insignificant. The third period for Zimbabwe provided evidence suggesting that changes in the fertility returns of women who have never had an abortion potentially played a role in the decrease in marital fertility rates between ZDHS1999 and ZDHS2005/06. As shown in Figure 6.8, if Zimbabwe's period 3 was characterised by changes in the fertility returns of women who never had abortion only, the magnitude of fertility decrease would have been greater than the observed by 27.4%.



	E	C	I	E	C	I	E	C	I	E	C	I	E	C	I
	Period 1: 1988-1994			Period 2: 1994-1999			Period 3: 1999-2005/06			Period 4: 2005/06-2010/11			Period 5: 2010/11-2015		
Contraceptive none	0.1	-0.3	0.0	0.0	2.6	0.0	-0.7	9.3	0.72	0.1	11.2	-0.1	4.0	-14.1	-6.1
Contraceptive modern	0.0	0.0	0.0	0.1	0.7	0.0	-0.5	-9.6	0.92	0.0	5.6	0.0	-2.2	-20.0	4.3
Contraceptive traditional	0.0	0.0	0.0	0.1	-0.2	-0.2	0.1	0.0	-0.02	0.1	-0.4	-0.1	0.0	0.7	0.1
Postpartum no	0.2	0.7	0.0	0.1	-4.0	0.2	0.1	9.8	-0.02	0.4	-7.8	-0.2	-0.1	9.8	-0.1
Postpartum yes	0.2	-0.3	0.0	0.1	1.3	0.2	0.1	-3.3	-0.02	0.4	2.8	-0.2	-0.1	-3.4	-0.1
Abortion no				0.0	4.4	-0.2	0.6	27.4	-0.66	0.1	1.7	0.0	0.0	7.5	0.3
Abortion yes				0.0	-0.7	-0.2	0.6	-3.8	-0.66	0.1	-0.3	0.0	0.0	-1.5	0.3

Figure 6.8: Contributions of the proximate determinants to fertility changes in Zimbabwe, DHS surveys 1988-2015

The coefficients associated with those who were not infecund (9.8%) and non-users of contraceptives (9.3%) were also supportive of the decrease in fertility for Zimbabwe's period 3. However, the conditional contribution of the coefficients associated with using modern contraceptives (-9.3%) operated to favour fertility increase. This means that the fertility returns to women using modern contraceptives increased between the ZDHS1999 and ZDHS2005-06. This was also the case with changes in the coefficients of those who had an abortion. These results thus suggest that despite explaining differentials in marital fertility rates, it is not always the case that proximate determinants were associated with the temporal decrease in marital fertility rates in Zimbabwe.

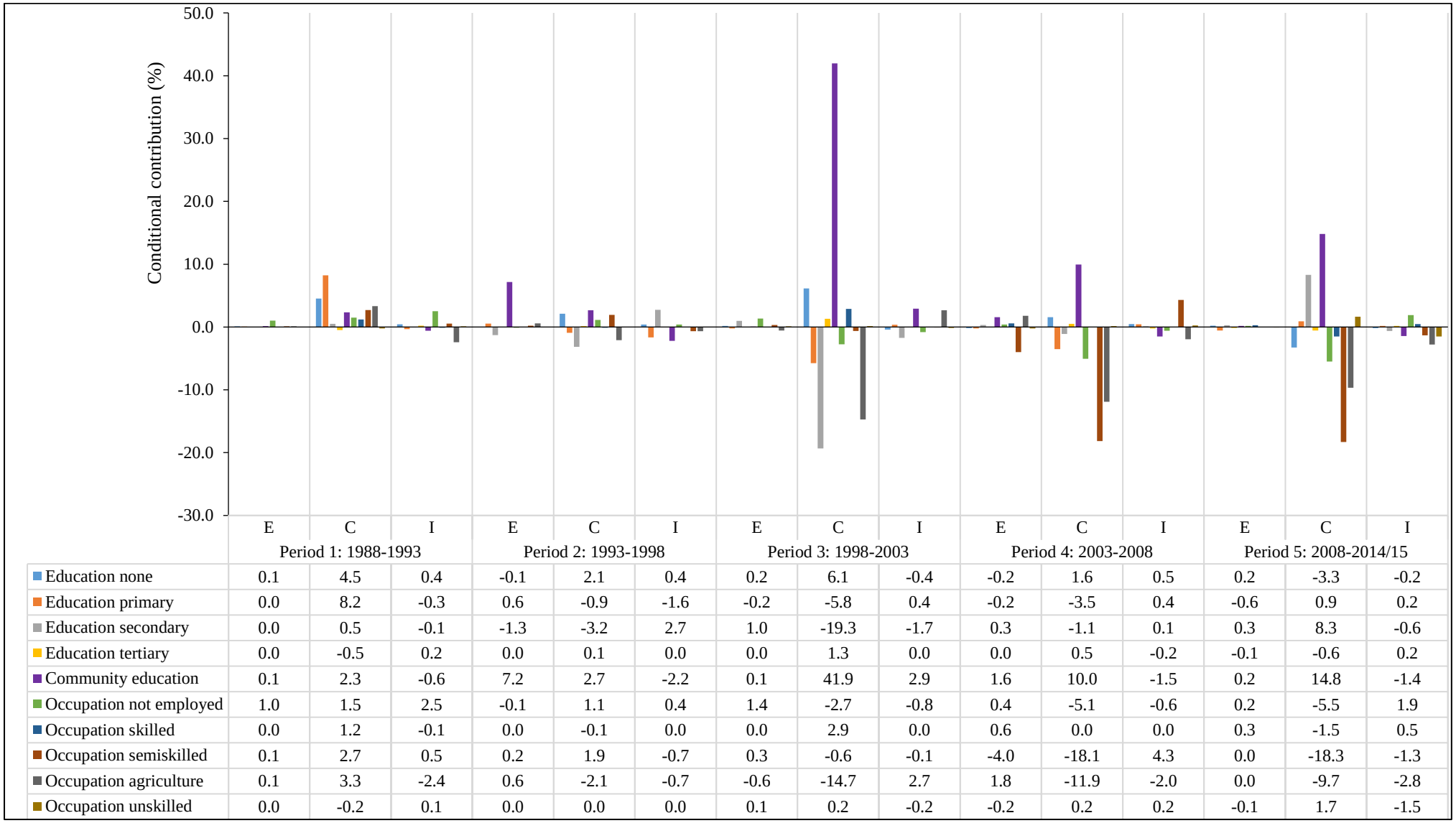
The changes in the fertility returns to proximate factors for Zimbabwe's period 4 were generally more consistent with the observed increase in marital fertility between the 2005-06 and 2010-11 ZDHS surveys compared to the preceding period 3. This is shown in the smaller conditional percentages which indicate that there was little residual force from the proximate determinants that was not realised in the temporal increase in marital fertility rates in period 4. The fourth period for Zimbabwe was the first inter-survey period where the mean ASMFR increased. The results shown in Figure 8.8 suggest that changes in the coefficients for non-users of contraceptives (11.2%) supported the increase in marital fertility between the ZDHS2005/06 and ZDHS2010/11. The result for modern contraceptives (5.6%) also suggests that fertility returns to users of modern contraception increase, thus supporting the stalling of marital fertility.

6.3.2 Contributions of female background variables to marital fertility transition

The detailed decomposition results for female education and occupation characteristics for Ghana are presented in Figure 6.9 below. The results show that the conditional contributions

of the variables were subdued in the first two inter-survey periods, suggesting that changes in these variables were largely reflected in the actual inter-survey fertility changes. From period 3 to period 5, there were notable detailed conditional contributions especially for secondary and community-level education and the semiskilled and agriculture occupation groups. The conditional contributions of coefficients were more prominent throughout the five inter-survey periods in Ghana. The first two periods saw conditional contributions of coefficients for most of the categories of education and occupation restricted to less than 5%. It was only changes in coefficients for primary education (8.2%) for period 1 and changes in endowments (7.2%) for period 2 that would have enhanced the magnitude of marital fertility decrease in Ghana by close to 10%. These results imply that the fertility inhibiting effects of the female background variables mostly translated to the onset of the marital fertility transition of Ghana and its continuation in the second inter-survey period.

There were notable conditional contributions of coefficients associated with community-level education status, secondary education and agricultural occupation for Ghana's period 3. It should be recalled that period 3 was that first to be characterised by increase in the mean ASMFR, a feature of stalled transition. The results reported in Figure 6.9 below show that the change in coefficients for community-level of women's education potentially contributed to the stalling of marital fertility transition. If period 3 experienced changes in the coefficients of community-level of female education, the magnitude of increase was going to be greater by 41.9% between the GDHS1998 and GDHS2003. On the contrary, changes in the fertility rates of women with secondary education (-19.3%) and those in agriculture jobs (-14.7%) favoured fertility decrease between the 1998 and 2003 GDHS surveys.

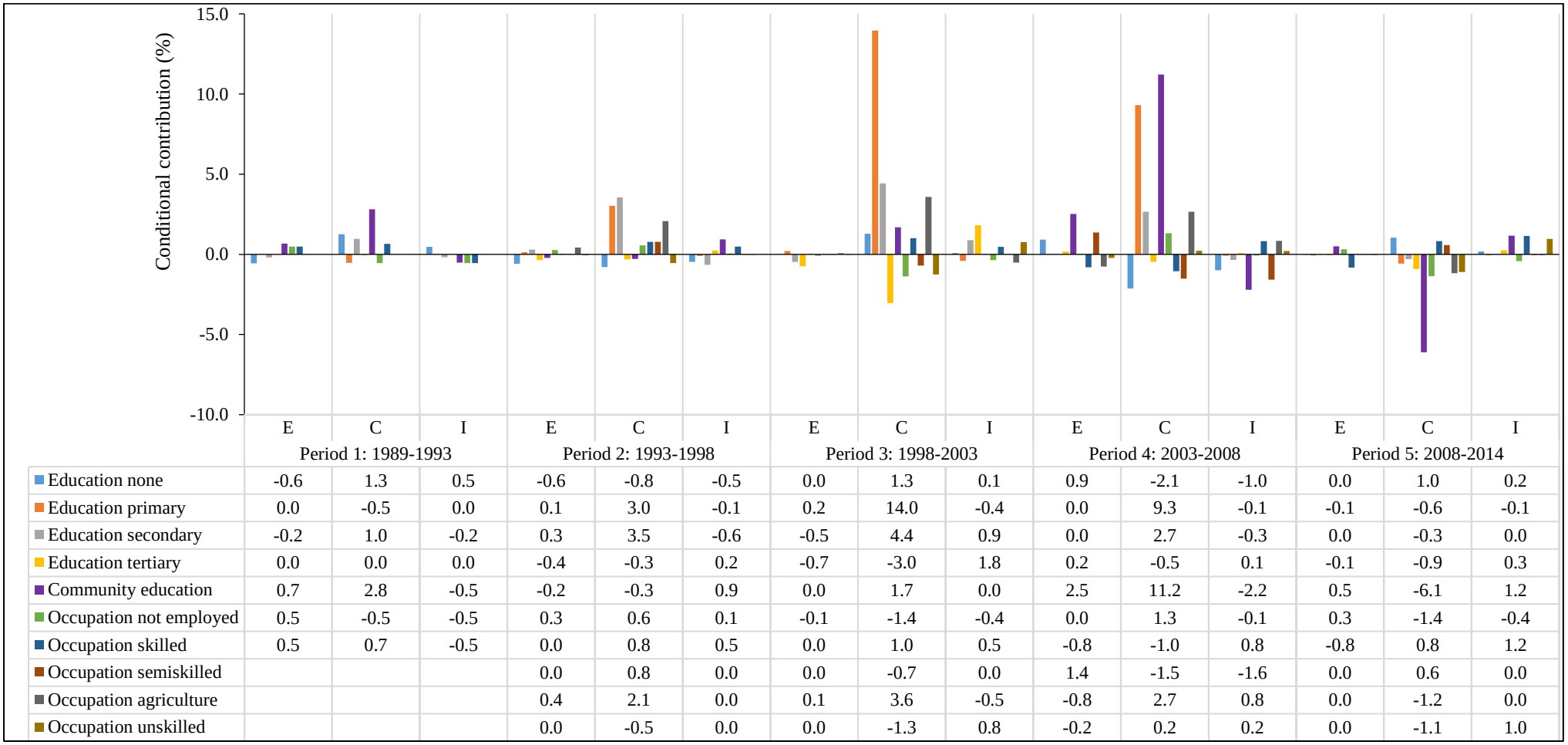


	Period 1: 1988-1993			Period 2: 1993-1998			Period 3: 1998-2003			Period 4: 2003-2008			Period 5: 2008-2014/15		
	E	C	I	E	C	I	E	C	I	E	C	I	E	C	I
Education none	0.1	4.5	0.4	-0.1	2.1	0.4	0.2	6.1	-0.4	-0.2	1.6	0.5	0.2	-3.3	-0.2
Education primary	0.0	8.2	-0.3	0.6	-0.9	-1.6	-0.2	-5.8	0.4	-0.2	-3.5	0.4	-0.6	0.9	0.2
Education secondary	0.0	0.5	-0.1	-1.3	-3.2	2.7	1.0	-19.3	-1.7	0.3	-1.1	0.1	0.3	8.3	-0.6
Education tertiary	0.0	-0.5	0.2	0.0	0.1	0.0	0.0	1.3	0.0	0.0	0.5	-0.2	-0.1	-0.6	0.2
Community education	0.1	2.3	-0.6	7.2	2.7	-2.2	0.1	41.9	2.9	1.6	10.0	-1.5	0.2	14.8	-1.4
Occupation not employed	1.0	1.5	2.5	-0.1	1.1	0.4	1.4	-2.7	-0.8	0.4	-5.1	-0.6	0.2	-5.5	1.9
Occupation skilled	0.0	1.2	-0.1	0.0	-0.1	0.0	0.0	2.9	0.0	0.6	0.0	0.0	0.3	-1.5	0.5
Occupation semiskilled	0.1	2.7	0.5	0.2	1.9	-0.7	0.3	-0.6	-0.1	-4.0	-18.1	4.3	0.0	-18.3	-1.3
Occupation agriculture	0.1	3.3	-2.4	0.6	-2.1	-0.7	-0.6	-14.7	2.7	1.8	-11.9	-2.0	0.0	-9.7	-2.8
Occupation unskilled	0.0	-0.2	0.1	0.0	0.0	0.0	0.1	0.2	-0.2	-0.2	0.2	0.2	-0.1	1.7	-1.5

Figure 6.9: Female background variables, Ghana DHS 1988-2014/15

The changes in coefficients that operated to reverse the direction of change in marital fertility for period 4 were those for women in semiskilled (-18.1%) and agriculture (-11.9%). The last inter-survey period for Ghana represented the second time Ghana experienced increase in the mean of ASMFR between two successive surveys – the GDHS2008 and GDHS2014/15. The increase in the mean ASMFR for period 5 was supported by changes in the coefficients associated with community-level education (14.8%) and secondary education (8.3%) while changes in the effects of being in semiskilled (-18.3%) and agriculture (-9.7%) favoured continuation of marital fertility decline extending from period 4. The overall picture for Ghana shows that female background variables had varying roles on marital fertility transition in Ghana. Some characteristics and segments of the Ghana sample supported marital fertility decline while others tended to favour stalling.

The results on female variables' contributions to marital fertility changes in Kenya are shown in Figure 6.10 below. The conditional contributions of female variables to Kenya's marital fertility transition appeared to be more pronounced in period 3 and 4 relative to other periods although there were only three instances of notable results. For Kenya's period 3, it was only the change in the coefficients for primary education (14%) that would have resulted in a greater magnitude of decrease in mean ASMFR from the observed 7.7 percentage-points. The conditional contribution of the coefficients for primary education was lower in period 4 (9.3%) than in period 3 while that for community-level education at 11.2% was the highest for this variable for all the five periods.

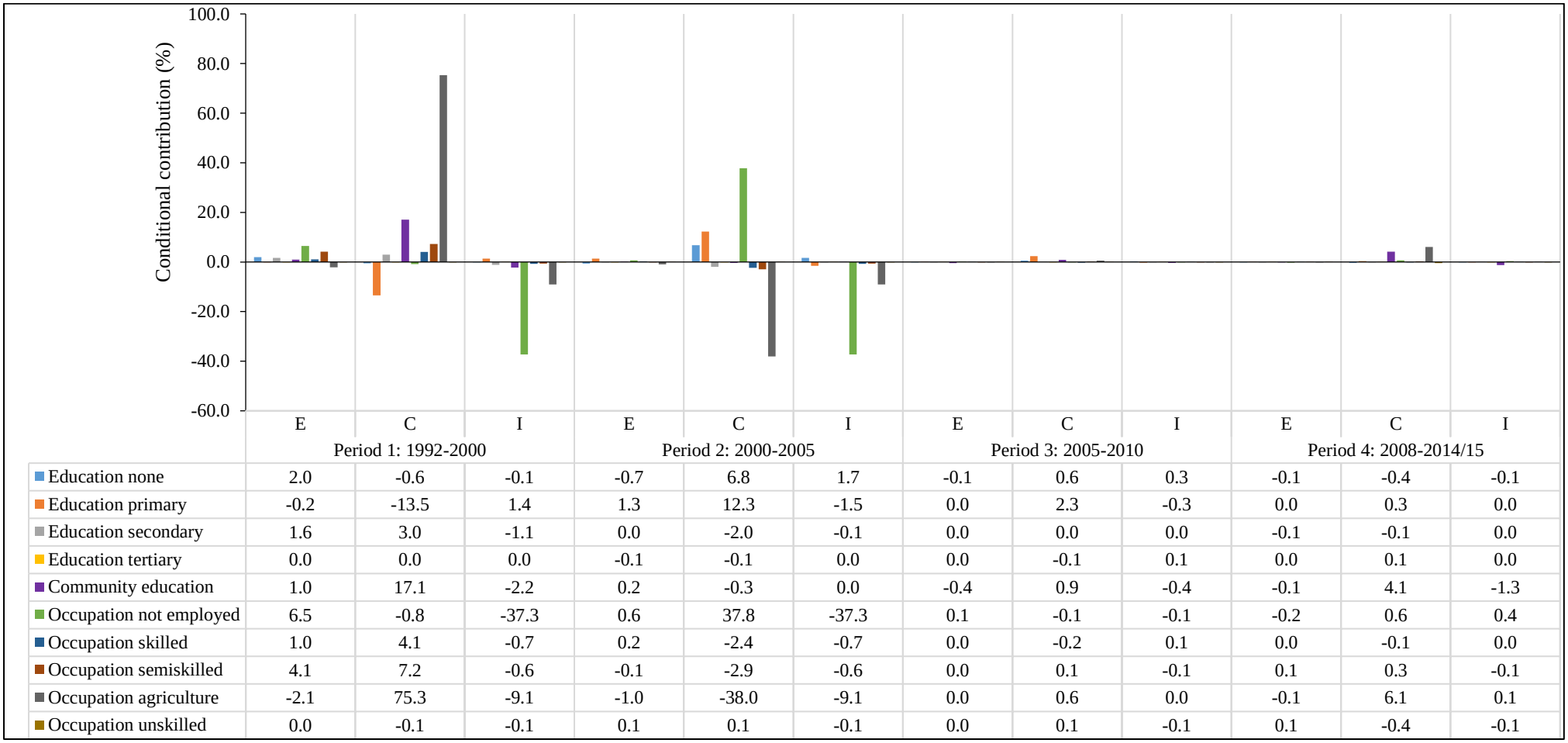


	Period 1: 1989-1993			Period 2: 1993-1998			Period 3: 1998-2003			Period 4: 2003-2008			Period 5: 2008-2014		
	E	C	I	E	C	I	E	C	I	E	C	I	E	C	I
Education none	-0.6	1.3	0.5	-0.6	-0.8	-0.5	0.0	1.3	0.1	0.9	-2.1	-1.0	0.0	1.0	0.2
Education primary	0.0	-0.5	0.0	0.1	3.0	-0.1	0.2	14.0	-0.4	0.0	9.3	-0.1	-0.1	-0.6	-0.1
Education secondary	-0.2	1.0	-0.2	0.3	3.5	-0.6	-0.5	4.4	0.9	0.0	2.7	-0.3	0.0	-0.3	0.0
Education tertiary	0.0	0.0	0.0	-0.4	-0.3	0.2	-0.7	-3.0	1.8	0.2	-0.5	0.1	-0.1	-0.9	0.3
Community education	0.7	2.8	-0.5	-0.2	-0.3	0.9	0.0	1.7	0.0	2.5	11.2	-2.2	0.5	-6.1	1.2
Occupation not employed	0.5	-0.5	-0.5	0.3	0.6	0.1	-0.1	-1.4	-0.4	0.0	1.3	-0.1	0.3	-1.4	-0.4
Occupation skilled	0.5	0.7	-0.5	0.0	0.8	0.5	0.0	1.0	0.5	-0.8	-1.0	0.8	-0.8	0.8	1.2
Occupation semiskilled				0.0	0.8	0.0	0.0	-0.7	0.0	1.4	-1.5	-1.6	0.0	0.6	0.0
Occupation agriculture				0.4	2.1	0.0	0.1	3.6	-0.5	-0.8	2.7	0.8	0.0	-1.2	0.0
Occupation unskilled				0.0	-0.5	0.0	0.0	-1.3	0.8	-0.2	0.2	0.2	0.0	-1.1	1.0

Figure 6.10: Contributions of female background variables in Kenya, DHS 1989-2014

The overall observation from Kenya's results reported in Figure 6.10 above is that the female background variables had in general less conditional percentage contributions compared to what was observed for Ghana. This suggests that the inter-survey decreases and increases of marital fertility rates in Kenya reflected the effects of female background variables better than in Ghana.

The detailed conditional contributions of the female education and occupation characteristics towards the inter-survey marital fertility increases and decreases over time in Rwanda were more notable for the first and second periods. As previously shown, periods 1 and 2 for Rwanda were characterised by increases in the average of ASMFRs. The detailed decomposition results presented in Figure 6.11 below show that there were characteristics of the Rwanda sample that potentially played a considerable role in the significant increases in marital fertility rates between 1992 and 2005. The changes in the coefficients for community-level education (17.1%) and employment in agriculture jobs (75.3%) arguably contributed to the increase in the mean ASMFR for Rwanda's period 1. This is because the changes in the coefficients for these segments of the sample operated to support increase in fertility; the changes in these coefficients alone between RDHS1992 and RDHS200 would have resulted in even bigger magnitude of increase in marital fertility. On the contrary, changes in fertility returns to primary education (-13.5%) favoured marital fertility decrease.



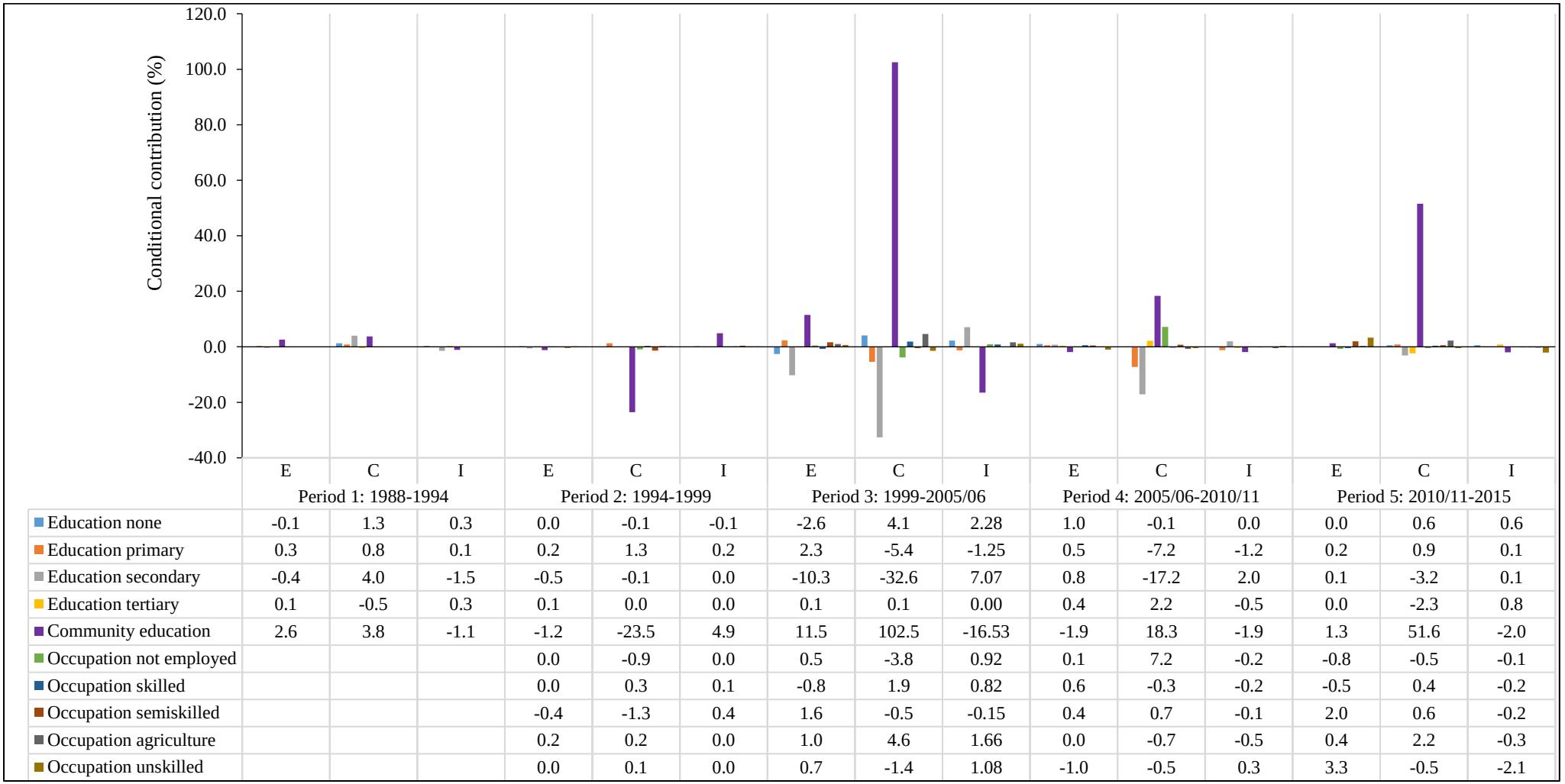
	Period 1: 1992-2000			Period 2: 2000-2005			Period 3: 2005-2010			Period 4: 2008-2014/15		
	E	C	I	E	C	I	E	C	I	E	C	I
Education none	2.0	-0.6	-0.1	-0.7	6.8	1.7	-0.1	0.6	0.3	-0.1	-0.4	-0.1
Education primary	-0.2	-13.5	1.4	1.3	12.3	-1.5	0.0	2.3	-0.3	0.0	0.3	0.0
Education secondary	1.6	3.0	-1.1	0.0	-2.0	-0.1	0.0	0.0	0.0	-0.1	-0.1	0.0
Education tertiary	0.0	0.0	0.0	-0.1	-0.1	0.0	0.0	-0.1	0.1	0.0	0.1	0.0
Community education	1.0	17.1	-2.2	0.2	-0.3	0.0	-0.4	0.9	-0.4	-0.1	4.1	-1.3
Occupation not employed	6.5	-0.8	-37.3	0.6	37.8	-37.3	0.1	-0.1	-0.1	-0.2	0.6	0.4
Occupation skilled	1.0	4.1	-0.7	0.2	-2.4	-0.7	0.0	-0.2	0.1	0.0	-0.1	0.0
Occupation semiskilled	4.1	7.2	-0.6	-0.1	-2.9	-0.6	0.0	0.1	-0.1	0.1	0.3	-0.1
Occupation agriculture	-2.1	75.3	-9.1	-1.0	-38.0	-9.1	0.0	0.6	0.0	-0.1	6.1	0.1
Occupation unskilled	0.0	-0.1	-0.1	0.1	0.1	-0.1	0.0	0.1	-0.1	0.1	-0.4	-0.1

Figure 6.11: Contributions of female background variables in Rwanda, DHS 1992-2014/15

There was a considerable interaction (-37.3%) relating to the category of women who were not employed which operated to hold back fertility increase in marital fertility. This interaction indicates that the RDHS1992 and RDHS2000 were considerably different in the endowments and coefficients of the women who were not employed, and these differences alone would have reduced the magnitude of fertility increase in Rwanda's period 1 by 37%.

The results for Rwanda's period 2 which involved the RDHS2000 and RDHS2005 also showed the existence of simultaneous differences in the endowments and coefficients of women who were not employed with an interaction of -373% which also operated to hold back the increase in marital fertility rates. The change in the coefficients associated with employment in agriculture jobs (-38%) for period 2, unlike for period 1, favoured fertility decrease. However, the changes in the effects of being in agriculture employment would have caused a magnitude of increase in the mean ASMFR which was greater than the observed 5.3 percentage-points by 37.8%. The onset of marital fertility transition in Rwanda post 2005 was associated with virtually no residual fertility inhibiting effects of female variables as reflected in the conditional percentage contributions close to zero for both period 3 and 4. The results for Rwanda can thus be interpreted as highlighting that female background variables were affected the decrease of marital fertility post-2005 than the pre-2005 increases.

The conditional contributions of the changing effects of female background variables on the marital fertility transition of Zimbabwe mostly came from community-level education for period 2 to period 5 [Figure 6.12]. This means that the inter-survey decreases and increase in the mean ASMFR in period 2 and 5 respectively were not large enough to reflect the full driving force of the fertility returns to community-level education status of married women.



	Period 1: 1988-1994			Period 2: 1994-1999			Period 3: 1999-2005/06			Period 4: 2005/06-2010/11			Period 5: 2010/11-2015		
	E	C	I	E	C	I	E	C	I	E	C	I	E	C	I
Education none	-0.1	1.3	0.3	0.0	-0.1	-0.1	-2.6	4.1	2.28	1.0	-0.1	0.0	0.0	0.6	0.6
Education primary	0.3	0.8	0.1	0.2	1.3	0.2	2.3	-5.4	-1.25	0.5	-7.2	-1.2	0.2	0.9	0.1
Education secondary	-0.4	4.0	-1.5	-0.5	-0.1	0.0	-10.3	-32.6	7.07	0.8	-17.2	2.0	0.1	-3.2	0.1
Education tertiary	0.1	-0.5	0.3	0.1	0.0	0.0	0.1	0.1	0.00	0.4	2.2	-0.5	0.0	-2.3	0.8
Community education	2.6	3.8	-1.1	-1.2	-23.5	4.9	11.5	102.5	-16.53	-1.9	18.3	-1.9	1.3	51.6	-2.0
Occupation not employed				0.0	-0.9	0.0	0.5	-3.8	0.92	0.1	7.2	-0.2	-0.8	-0.5	-0.1
Occupation skilled				0.0	0.3	0.1	-0.8	1.9	0.82	0.6	-0.3	-0.2	-0.5	0.4	-0.2
Occupation semiskilled				-0.4	-1.3	0.4	1.6	-0.5	-0.15	0.4	0.7	-0.1	2.0	0.6	-0.2
Occupation agriculture				0.2	0.2	0.0	1.0	4.6	1.66	0.0	-0.7	-0.5	0.4	2.2	-0.3
Occupation unskilled				0.0	0.1	0.0	0.7	-1.4	1.08	-1.0	-0.5	0.3	3.3	-0.5	-2.1

Figure 6.12: Contributions of female background variables in Zimbabwe, DHS 1988-2015

Out of the four levels of education attainment, secondary had greater conditional percentage contributions. The results presented in Figure 6.12 above show that the first notable conditional percentage contribution of the changing effects of community-level education was observed in period 2. Between the ZDHS1994 and ZDHS1999, the changes in the fertility returns to education as average female education increased operated to hold back the pace of marital fertility decrease. As reported in Figure 7.4, Zimbabwe's period 2 experienced a 12.2 percentage-points decrease in the mean ASMFR. If this period was characterised by changes in the association between average community-level of female education and ASMFRs, the magnitude of the decrease in the mean ASMFR was going to be less than 12.2 percentage-points by 23.5%. This is because the temporal changes in the fertility returns to community-level female education operated to reverse the downward shift in marital fertility rates. In other secondary education or higher had was associated with greater fertility returns in the ZDHS1999 than the ZDHS1994. This temporal increase in the fertility rates of the more educated women was however not large enough to reverse the transition.

There were some notable conditional contributions from the compositional changes in Zimbabwe's period 3 involving the ZDHS1999 and ZDHS2005/06. This period experienced a very small change in marital fertility with the mean of ASMFRs decreasing by a mere 2.7 percentage-points. The increase in the proportions of married women with secondary education (-10.3%) as well as the increased fertility returns to secondary education (-32.6%) between the two ZDHS surveys appeared to favour an increase in marital fertility. Looking at changes in coefficients overall, the standout result was for community-level of education. As shown in Figure 7.12, if Zimbabwe's period 3 had changes in coefficients associated with community-level of education, the decrease in the mean of ASMFRs would have been 102.5% greater than the observed 2.7 percentage-points. Such a large conditional percentage contribution indicate

that the community-level education characteristic had minimal impact on the actual temporal changes in marital fertility.

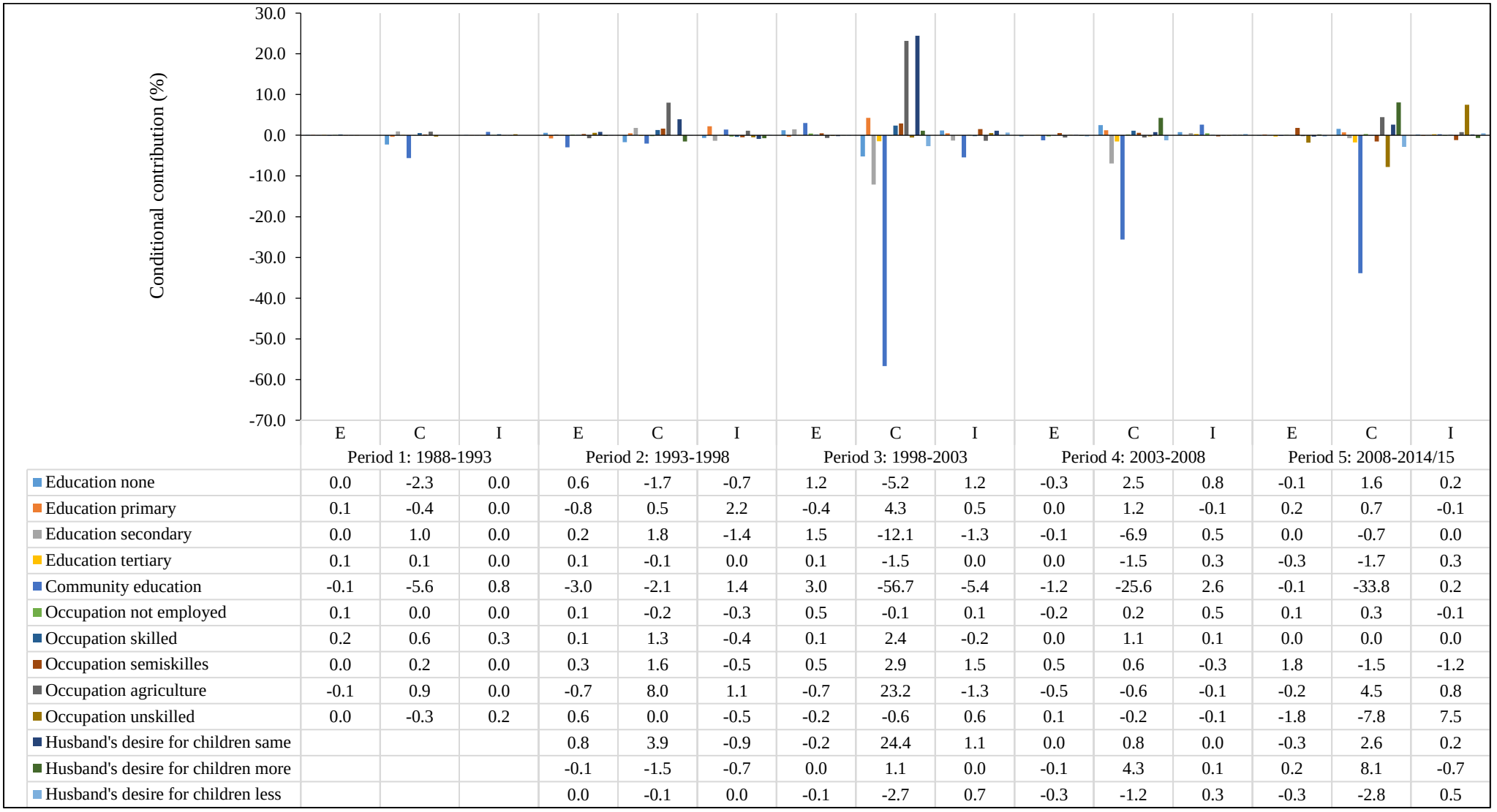
Periods 4 and 5 for Zimbabwe were characterised by more subdued conditional contributions of the coefficients for community-level education. This arguably reflects that the inter-survey increases in the mean ASMFRs for the last two periods were more consistent with the fertility-enhancing temporal upwards shift of the coefficient for the community-level education status of women. At the individual level, the results reported in Figure 6.12 show that there were very small conditional percentage contributions of the education and employment characteristics of the women for both endowments and coefficients. Overall, this suggests that the temporal compositional changes and associated with coefficients mostly yielded forces that translated to actual decreases and increases in marital fertility.

6.3.3 The role of male variables in marital fertility transition

The estimation of the role of male variables in the marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe yielded some interesting results reflective of the importance of men in the fertility regimes of countries from SSA. This section presents findings from the decomposition analyses applied to DHS data from Ghana, Kenya, Rwanda and Zimbabwe. The first set of results to be presented are those for Ghana which are shown in Figure 6.13 below. Just like for female variables, the fertility influence of male variables in Ghana was mostly in terms of coefficients which were more pronounced in period 3 and to a less extent period 4 and 5. In the first two periods for Ghana, the conditional percentage contributions were mostly below 5% with only effects of male community-level education (-5.6%) in period 1 and

employment in agriculture jobs (8%) found to have some potential to affect marital fertility change between successive surveys.

The conditional contributions of the coefficients for Ghana's period 3 especially those for community-level of husbands' education (-56.7%), having a husband employed in agriculture job (23.2%) and having a husband with same desire for children (24.4%) showed potential for these variables to affect temporal change in the mean ASMFR.



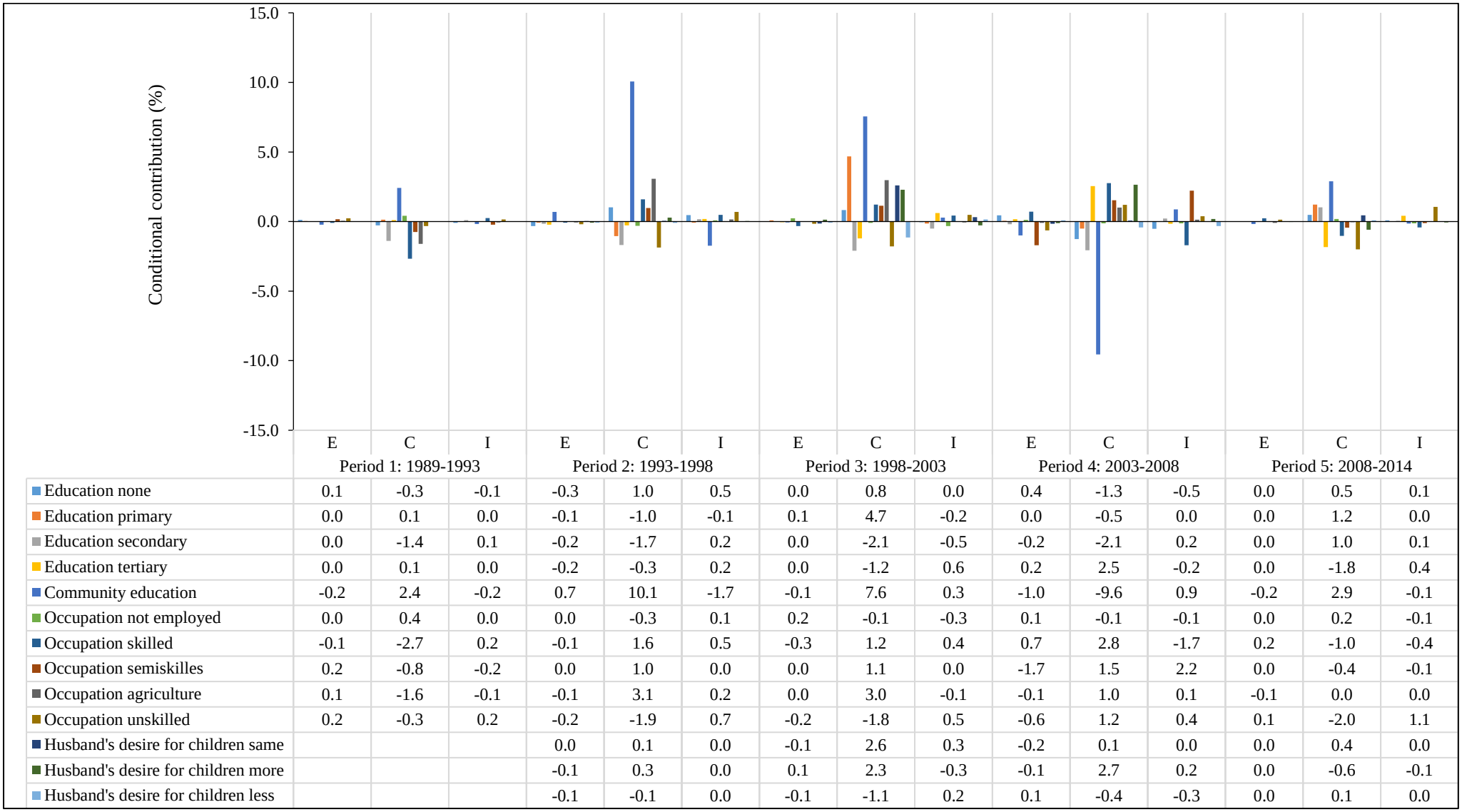
	E	C	I	E	C	I	E	C	I	E	C	I	E	C	I
	Period 1: 1988-1993			Period 2: 1993-1998			Period 3: 1998-2003			Period 4: 2003-2008			Period 5: 2008-2014/15		
Education none	0.0	-2.3	0.0	0.6	-1.7	-0.7	1.2	-5.2	1.2	-0.3	2.5	0.8	-0.1	1.6	0.2
Education primary	0.1	-0.4	0.0	-0.8	0.5	2.2	-0.4	4.3	0.5	0.0	1.2	-0.1	0.2	0.7	-0.1
Education secondary	0.0	1.0	0.0	0.2	1.8	-1.4	1.5	-12.1	-1.3	-0.1	-6.9	0.5	0.0	-0.7	0.0
Education tertiary	0.1	0.1	0.0	0.1	-0.1	0.0	0.1	-1.5	0.0	0.0	-1.5	0.3	-0.3	-1.7	0.3
Community education	-0.1	-5.6	0.8	-3.0	-2.1	1.4	3.0	-56.7	-5.4	-1.2	-25.6	2.6	-0.1	-33.8	0.2
Occupation not employed	0.1	0.0	0.0	0.1	-0.2	-0.3	0.5	-0.1	0.1	-0.2	0.2	0.5	0.1	0.3	-0.1
Occupation skilled	0.2	0.6	0.3	0.1	1.3	-0.4	0.1	2.4	-0.2	0.0	1.1	0.1	0.0	0.0	0.0
Occupation semiskilles	0.0	0.2	0.0	0.3	1.6	-0.5	0.5	2.9	1.5	0.5	0.6	-0.3	1.8	-1.5	-1.2
Occupation agriculture	-0.1	0.9	0.0	-0.7	8.0	1.1	-0.7	23.2	-1.3	-0.5	-0.6	-0.1	-0.2	4.5	0.8
Occupation unskilled	0.0	-0.3	0.2	0.6	0.0	-0.5	-0.2	-0.6	0.6	0.1	-0.2	-0.1	-1.8	-7.8	7.5
Husband's desire for children same				0.8	3.9	-0.9	-0.2	24.4	1.1	0.0	0.8	0.0	-0.3	2.6	0.2
Husband's desire for children more				-0.1	-1.5	-0.7	0.0	1.1	0.0	-0.1	4.3	0.1	0.2	8.1	-0.7
Husband's desire for children less				0.0	-0.1	0.0	-0.1	-2.7	0.7	-0.3	-1.2	0.3	-0.3	-2.8	0.5

Figure 6.13: Contributions of male variables in Ghana, DHS 1988-2014/15

It should be recalled that this period had a 2.7-percentage-points increase in the mean ASMFR, a characteristic of stalling. Consequently, meaningful conditional contributions would need to be more than 100% for a variable to be regarded as having a real potential to significantly change the magnitude and direction of changed in the mean ASMFR. The results for Ghana's period 3 thus provide limited evidence to argue strongly on the drivers of marital fertility increase or decrease over time owing to the inherent limitation of regression-based decompositions.

The last two inter-survey periods for Ghana were characterised more sizeable changes in the mean ASMFR. Period 4 had a 6.7-percentage-points increase while period 5 saw a 6.3-percentage-points decrease in the mean of ASMFRs. For both periods, changes in the coefficients for community-level of husbands' education was the main male variable with notable conditional contributions. With regards period 4, the magnitude of decrease would have been 25.6% greater than the 6.7 percentage-points if the only change for the period were the coefficients associated with husbands' community-level education status. Meanwhile, changes in the coefficients for community-level education status of husbands only would have reduced the magnitude of marital fertility increase by 33.8% in Ghana's period 5. The overall observation from the results for Ghana is that the most important variable for assessing the role of male variables in the marital fertility transition was the education the education status of husbands at the community level.

The estimates of the conditional percentage contributions of male variables to the marital fertility transition of Kenya are presented in Figure 6.14 below.

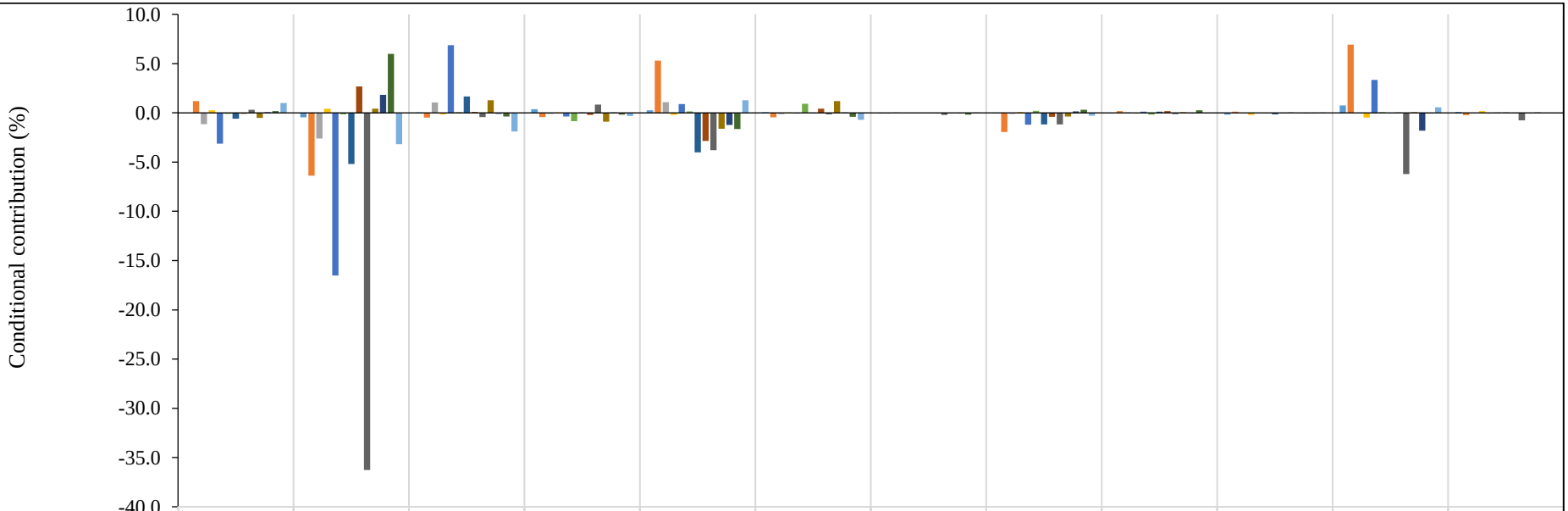


Education none	0.1	-0.3	-0.1	-0.3	1.0	0.5	0.0	0.8	0.0	0.4	-1.3	-0.5	0.0	0.5	0.1
Education primary	0.0	0.1	0.0	-0.1	-1.0	-0.1	0.1	4.7	-0.2	0.0	-0.5	0.0	0.0	1.2	0.0
Education secondary	0.0	-1.4	0.1	-0.2	-1.7	0.2	0.0	-2.1	-0.5	-0.2	-2.1	0.2	0.0	1.0	0.1
Education tertiary	0.0	0.1	0.0	-0.2	-0.3	0.2	0.0	-1.2	0.6	0.2	2.5	-0.2	0.0	-1.8	0.4
Community education	-0.2	2.4	-0.2	0.7	10.1	-1.7	-0.1	7.6	0.3	-1.0	-9.6	0.9	-0.2	2.9	-0.1
Occupation not employed	0.0	0.4	0.0	0.0	-0.3	0.1	0.2	-0.1	-0.3	0.1	-0.1	-0.1	0.0	0.2	-0.1
Occupation skilled	-0.1	-2.7	0.2	-0.1	1.6	0.5	-0.3	1.2	0.4	0.7	2.8	-1.7	0.2	-1.0	-0.4
Occupation semiskilles	0.2	-0.8	-0.2	0.0	1.0	0.0	0.0	1.1	0.0	-1.7	1.5	2.2	0.0	-0.4	-0.1
Occupation agriculture	0.1	-1.6	-0.1	-0.1	3.1	0.2	0.0	3.0	-0.1	-0.1	1.0	0.1	-0.1	0.0	0.0
Occupation unskilled	0.2	-0.3	0.2	-0.2	-1.9	0.7	-0.2	-1.8	0.5	-0.6	1.2	0.4	0.1	-2.0	1.1
Husband's desire for children same				0.0	0.1	0.0	-0.1	2.6	0.3	-0.2	0.1	0.0	0.0	0.4	0.0
Husband's desire for children more				-0.1	0.3	0.0	0.1	2.3	-0.3	-0.1	2.7	0.2	0.0	-0.6	-0.1
Husband's desire for children less				-0.1	-0.1	0.0	-0.1	-1.1	0.2	0.1	-0.4	-0.3	0.0	0.1	0.0

Figure 6.14: Contributions of male variables in Kenya, DHS 1989-2014

The results show that the variable with the most individual conditional contribution was education status of husband at the community-level. The component of the decomposition that showed greater importance was coefficients and this was from period 2 to period 4. The conditional contribution of community-level male education for period 2 would have seen the mean ASMFR decrease by 12 percentage-points if no other changes were experienced between KDHS1993 and KDHS1998 instead of the observed 10.8 percentage-points. For period 3, the magnitude of the increase in the mean ASMFR between KDHS1998 and KDHS2003 would have been greater than 7.7 percentage-points by 7.6% if the only change were coefficients for community-level male education. Meanwhile, the changes in the coefficients for community-level male education operated to favour fertility increase in Kenya's period 4. The overall picture of results in Figure 6.14 show that marital fertility was more responsive to average male education status compared to any other male characteristic.

The changes in the compositional characteristics of men and the fertility returns to the characteristics for Rwanda showed limited evidence to suggest notable role of male variables to the marital fertility trends of the country. For the first inter-survey period which was marked by significant increases in the mean ASMFRs, notable conditional contributions were observed for coefficients associated with community-level male education and employment in agriculture jobs. These contributions however, operated to curb the increase in marital fertility increase. Based on the results reported in Figure 6.15, if Rwanda experienced changes in the fertility effects of community-level male education between RDHS1992 and RDHS2000, the magnitude of marital fertility increase was going to be less than the observed 3.3 percentage-points by 16.5%.

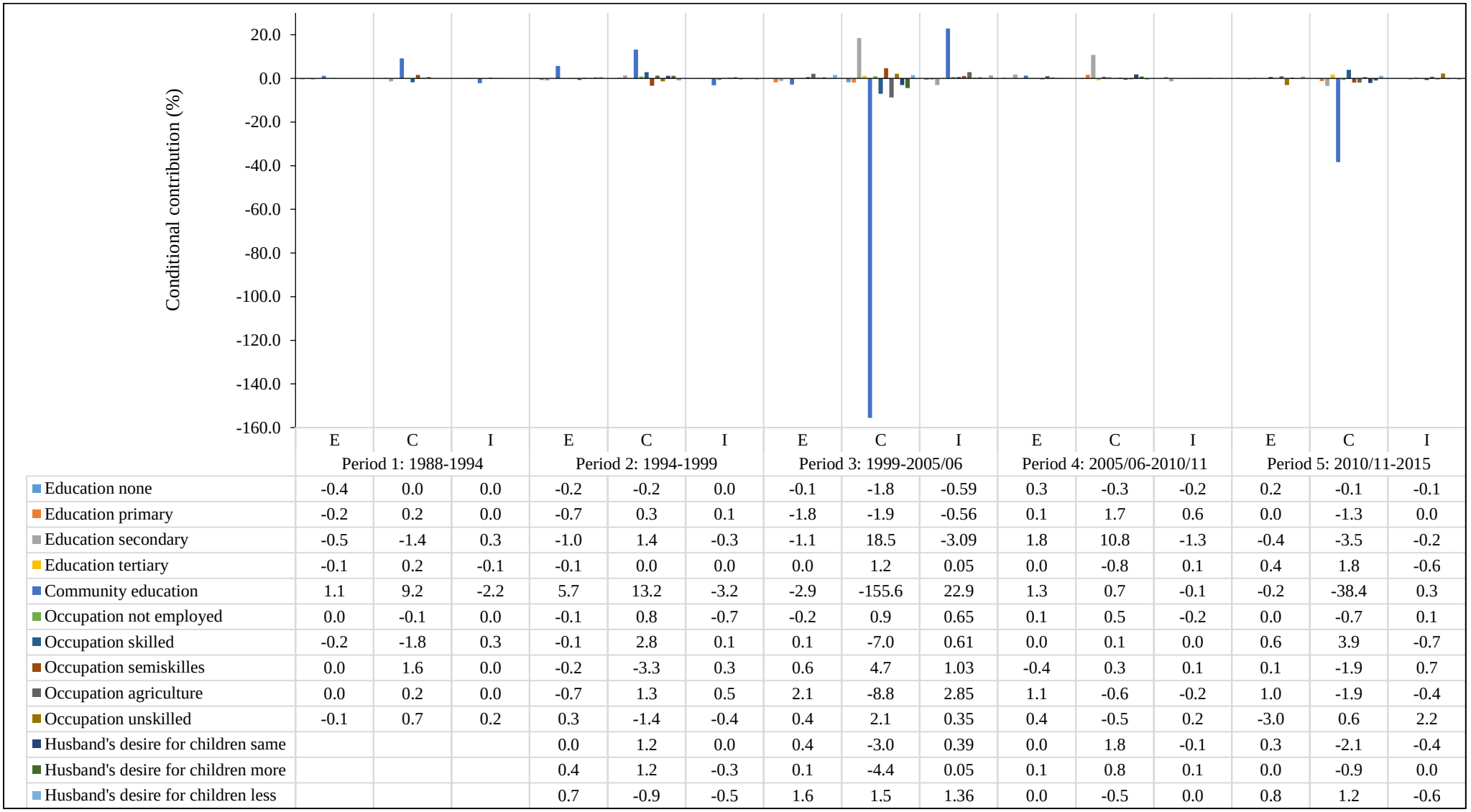


	Period 1: 1992-2000			Period 2: 2000-2005			Period 3: 2005-2010			Period 4: 2008-2014/15		
	E	C	I	E	C	I	E	C	I	E	C	I
Education none	0.0	-0.5	0.0	0.4	0.3	0.1	-0.1	0.0	0.0	-0.2	0.8	0.1
Education primary	1.2	-6.4	-0.5	-0.4	5.3	-0.5	-0.1	-1.9	0.2	0.1	6.9	-0.2
Education secondary	-1.2	-2.6	1.1	-0.1	1.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0
Education tertiary	0.3	0.4	-0.1	0.0	-0.2	0.0	0.0	0.1	0.0	-0.2	-0.5	0.2
Community education	-3.1	-16.5	6.9	-0.4	0.9	-0.1	0.0	-1.2	0.1	0.0	3.3	0.0
Occupation not employed	-0.1	-0.1	0.1	-0.8	0.2	0.9	0.0	0.2	-0.2	0.0	0.1	0.0
Occupation skilled	-0.6	-5.2	1.7	0.0	-4.0	0.0	0.0	-1.2	0.1	-0.1	0.0	0.0
Occupation semiskilles	-0.1	2.7	0.1	-0.2	-2.8	0.4	0.0	-0.4	0.2	0.0	0.0	0.0
Occupation agriculture	0.3	-36.3	-0.4	0.9	-3.8	-0.2	-0.2	-1.2	-0.1	0.0	-6.2	-0.7
Occupation unskilled	-0.5	0.4	1.3	-0.9	-1.6	1.2	0.0	-0.4	0.1	0.0	0.1	0.0
Husband's desire for children same	0.1	1.8	-0.1	0.0	-1.2	0.0	0.0	0.1	0.0	0.0	-1.8	0.0
Husband's desire for children more	0.2	6.0	-0.4	-0.2	-1.6	-0.4	-0.2	0.3	0.3	0.0	0.0	0.0
Husband's desire for children less	1.0	-3.2	-1.9	-0.3	1.3	-0.7	0.0	-0.3	0.0	0.0	0.6	0.0

Figure 6.15: Contributions of male variables in Rwanda, DHS 1992-2014/15

The conditional impact of effects of male agriculture occupation was even greater and would have resulted in the increase of the mean ASMFR that was 36.3% less than 3.3 percentage-points. An interesting variable that was in favour of the fertility increase for Rwanda's period 1 was husband's desire for more children which would have increased the magnitude of the gap between RDHS1992 and RDHS2000 by 6%. The result for this variable implies that fertility returns for women with husbands who desired more children increased between the two surveys. For the subsequent periods from period 2 to period 4, the conditional contributions of male variables to the temporal marital fertility changes in Rwanda were very small. This means that male variables had a limited influence on the post-2000 trends in the marital fertility rates of Rwanda.

The results of the estimates of the conditional contributions of male variables to the marital fertility transition of Zimbabwe are presented in Figure 6.16 below. These results show more instances of male variables affecting fertility than in the other countries especially Rwanda. The most notable conditional contributions were coefficients associated with community-level male education. There was a 15.4 percentage-points decrease in the mean ASMFR between ZDHS1988 and ZDHS1994 and the reduction in fertility returns to community-level male education would have increased the magnitude of decrease by 9.2%. The potential effect of temporal changes in the coefficients associated with community-level male education was an even greater conditional contribution for Zimbabwe's period 3 where the impact would have been to increase the magnitude of fertility decrease by 13.2%. Zimbabwe's period 2 also showed that compositional characteristics by community-level male education supported the decrease in marital fertility between ZDHS1994 and ZDHS1999 although the percentage contribution was only 5.7%.



Education none	-0.4	0.0	0.0	-0.2	-0.2	0.0	-0.1	-1.8	-0.59	0.3	-0.3	-0.2	0.2	-0.1	-0.1
Education primary	-0.2	0.2	0.0	-0.7	0.3	0.1	-1.8	-1.9	-0.56	0.1	1.7	0.6	0.0	-1.3	0.0
Education secondary	-0.5	-1.4	0.3	-1.0	1.4	-0.3	-1.1	18.5	-3.09	1.8	10.8	-1.3	-0.4	-3.5	-0.2
Education tertiary	-0.1	0.2	-0.1	-0.1	0.0	0.0	0.0	1.2	0.05	0.0	-0.8	0.1	0.4	1.8	-0.6
Community education	1.1	9.2	-2.2	5.7	13.2	-3.2	-2.9	-155.6	22.9	1.3	0.7	-0.1	-0.2	-38.4	0.3
Occupation not employed	0.0	-0.1	0.0	-0.1	0.8	-0.7	-0.2	0.9	0.65	0.1	0.5	-0.2	0.0	-0.7	0.1
Occupation skilled	-0.2	-1.8	0.3	-0.1	2.8	0.1	0.1	-7.0	0.61	0.0	0.1	0.0	0.6	3.9	-0.7
Occupation semiskilles	0.0	1.6	0.0	-0.2	-3.3	0.3	0.6	4.7	1.03	-0.4	0.3	0.1	0.1	-1.9	0.7
Occupation agriculture	0.0	0.2	0.0	-0.7	1.3	0.5	2.1	-8.8	2.85	1.1	-0.6	-0.2	1.0	-1.9	-0.4
Occupation unskilled	-0.1	0.7	0.2	0.3	-1.4	-0.4	0.4	2.1	0.35	0.4	-0.5	0.2	-3.0	0.6	2.2
Husband's desire for children same				0.0	1.2	0.0	0.4	-3.0	0.39	0.0	1.8	-0.1	0.3	-2.1	-0.4
Husband's desire for children more				0.4	1.2	-0.3	0.1	-4.4	0.05	0.1	0.8	0.1	0.0	-0.9	0.0
Husband's desire for children less				0.7	-0.9	-0.5	1.6	1.5	1.36	0.0	-0.5	0.0	0.8	1.2	-0.6

Figure 6.16: Contributions of male variables in Zimbabwe, DHS 1988-2015

Zimbabwe's period 3, which had the smallest inter-survey difference in the means of ASMFRs, had the largest percentage contributions of male variables to the change in marital fertility rates. Despite that one of the weaknesses of decomposition analysis is that the power of the method is reduced when dealing with small differences, the results for period 3 have important implications. The ZDHS1999-ZDHS2005/06 period was the first to show that the temporal changes in the coefficients for male variables especially community education (-155.6%) and employment in agriculture (-8.8%) and skilled (-7%) favoured stalling of marital fertility transition in Zimbabwe. If Zimbabwe's period 3 was characterised by changes in the coefficients of these three variables only, the country would have witnessed increased marital fertility between the 1999 and 2005/06 ZDHS surveys. It was only the coefficients associated with secondary education status (18.5%) of husbands that favoured the continued downward shift in marital fertility rates.

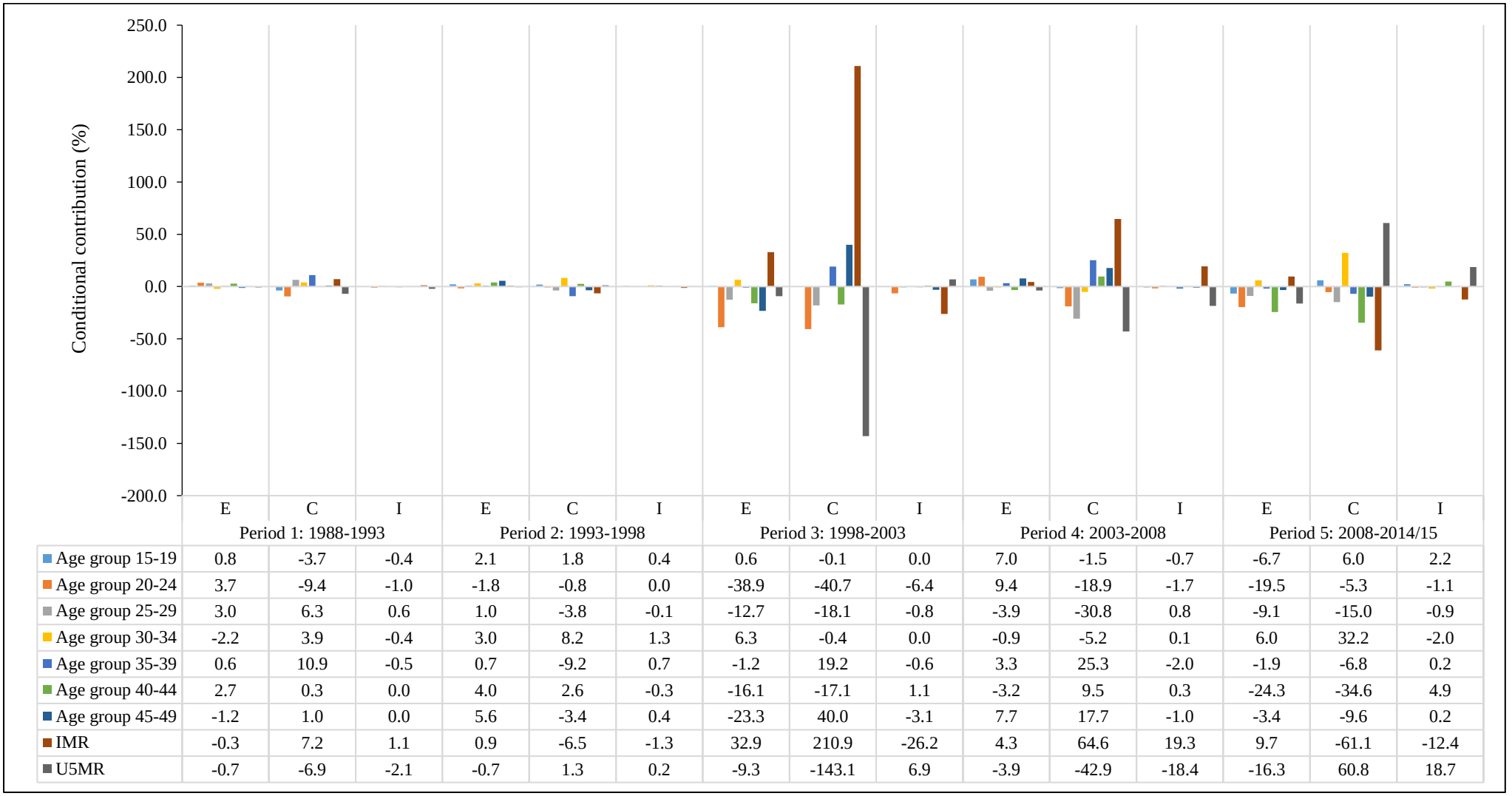
The results for period 3 in Zimbabwe were interesting because their implication was arguably fulfilled in period 4 as marital fertility increased for the first time in the country. As reported in section 7.2, the fourth inter-survey period involving ZDHS2005/06 and ZDHS2010/11 had a 6.2-percentage-points increase in the mean of ASMFRs. This increase can be interpreted as the culmination of the influences of male variables which had favoured inter-survey marital fertility increase starting in period 3. The very small conditional contributions for period 4 can thus be interpreted as affirming that temporal changes in male variables' fertility enhancing effects were in sync with the observed 6.2-percentage-points increase in the mean ASMFR in period 4. Looking at period 5 which also had increased marital fertility rates, it can be observed that the impact of coefficients for community-level male education was to reduce the magnitude of increase by 38.4%. This means that there was a shift in the driving force of male education from supporting fertility increase in periods 3 and 4 to pushing for fertility decrease.

The overall observation for results from Zimbabwe is that community-level education was more influential in the marital fertility trends of Zimbabwe compared to other male variables.

6.3.4 Demographic variables and marital fertility transition

Demographic variables especially age group were found to predict cross-sectional differences in the marital fertility rates with mostly consistent statistical significance. A study of fertility transition that ends at standard regression methods would therefore conclude that age group is an important predictor of fertility trends without the necessary evidence to prove so or otherwise. This section presents results that provide evidence on the role of changes in the compositional and fertility returns to demographic variables in the marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe. Following on the presentation structure of the preceding sections, the description of the results proceeds alphabetically starting with Ghana.

The results for Ghana which are presented in Figure 6.17 below show that the largest conditional contributions of age group were from period 3 to period 5 and this was also the case for IMR and CMR. The most important component of the results for demographic variables were coefficients although endowments also showed considerable potential that they affected fertility changes especially for periods 3 and 5. Recalling that Ghana's period 3 was the only one to experience fertility increase, it is noteworthy pointing out that this increase was favoured by changes in the fertility returns to the 35-39 (19.2%) and 45-49 (40%) age groups as well as IMR (210.9%). If the GDHS1998 and GDHS2003 were differentiated by IMR only, the magnitude of increase in marital fertility would have more than doubled the observed 2.7-percentage-points.



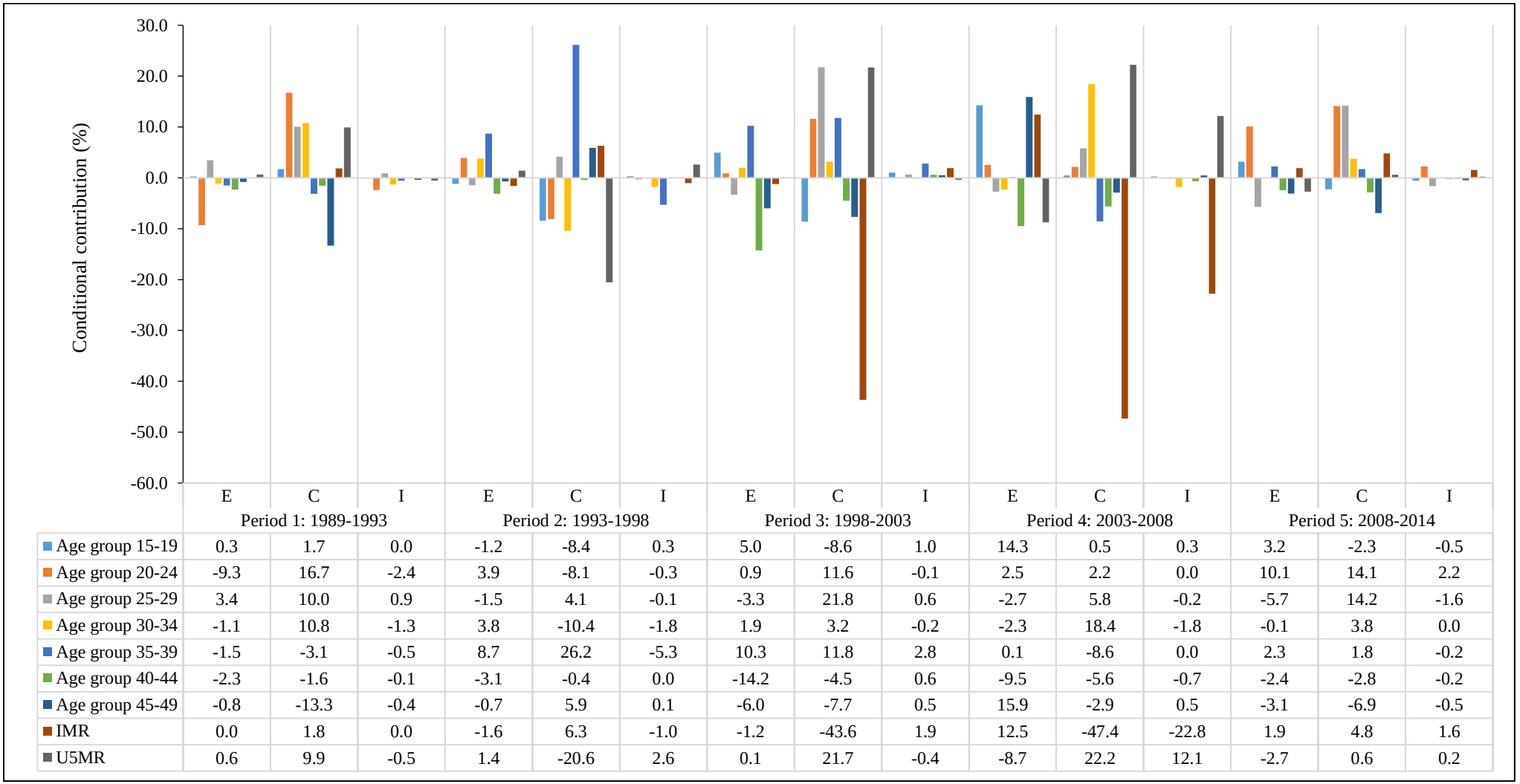
	E	C	I	E	C	I	E	C	I	E	C	I	E	C	I
	Period 1: 1988-1993			Period 2: 1993-1998			Period 3: 1998-2003			Period 4: 2003-2008			Period 5: 2008-2014/15		
Age group 15-19	0.8	-3.7	-0.4	2.1	1.8	0.4	0.6	-0.1	0.0	7.0	-1.5	-0.7	-6.7	6.0	2.2
Age group 20-24	3.7	-9.4	-1.0	-1.8	-0.8	0.0	-38.9	-40.7	-6.4	9.4	-18.9	-1.7	-19.5	-5.3	-1.1
Age group 25-29	3.0	6.3	0.6	1.0	-3.8	-0.1	-12.7	-18.1	-0.8	-3.9	-30.8	0.8	-9.1	-15.0	-0.9
Age group 30-34	-2.2	3.9	-0.4	3.0	8.2	1.3	6.3	-0.4	0.0	-0.9	-5.2	0.1	6.0	32.2	-2.0
Age group 35-39	0.6	10.9	-0.5	0.7	-9.2	0.7	-1.2	19.2	-0.6	3.3	25.3	-2.0	-1.9	-6.8	0.2
Age group 40-44	2.7	0.3	0.0	4.0	2.6	-0.3	-16.1	-17.1	1.1	-3.2	9.5	0.3	-24.3	-34.6	4.9
Age group 45-49	-1.2	1.0	0.0	5.6	-3.4	0.4	-23.3	40.0	-3.1	7.7	17.7	-1.0	-3.4	-9.6	0.2
IMR	-0.3	7.2	1.1	0.9	-6.5	-1.3	32.9	210.9	-26.2	4.3	64.6	19.3	9.7	-61.1	-12.4
U5MR	-0.7	-6.9	-2.1	-0.7	1.3	0.2	-9.3	-143.1	6.9	-3.9	-42.9	-18.4	-16.3	60.8	18.7

Figure 6.17: Demographic variables' contributions in Ghana, DHS 1988-2014/15

The coefficients associated with other age groups namely 20-24 years (40.7%), 25-29 years (18.1%) and 40-44 years (17.1%) implied that the fertility returns to these age groups decreased between GDHS1998 and GDHS2003 and favoured a continuation of marital fertility decline which prevailed in periods 1 and 2. There were compositional changes in 20-24 (38.9%), 25-29 (12.7%) 40-44 (16.1) and 45-49 (23.3%) age groups which favoured decreases in marital fertility.

Ghana's period 4 saw a considerable reduction in the conditional contribution of IMR from the 210.9% for period 3 to 64.6%. Furthermore, IMR favoured the decrease in marital fertility between GDHS2003 and GDHS2008 unlike in period 3. On the contrary, the change in the coefficients for CMR (-42.9%) operated to hold back the decrease in marital fertility for period 4. The coefficients for age groups below 30 years were also operated to reverse the decrease in marital fertility for period 4 while those from 35-39 upwards favoured fertility decline. Looking at period 5, the 6.3-percentage-points increase in the mean ASMFR between GDHS2008 and GDHS2014/15 occurred without the supportive contributions of changing fertility returns to all age groups except 15-19 and 30-34 years as well as CMR. The results for Ghana's period 5 thus imply that demographic variables were largely opposed to the increase in marital fertility. Both endowments and coefficients of the demographic factors did not favour fertility increase. This means that the sources of marital fertility increase between the 2008 and 2014/15 GDHS surveys lied in other factors besides demographic variables.

The conditional contributions of demographic variables to the marital fertility transition of Kenya are presented in Figure 6.18 below.



	E	C	I	E	C	I	E	C	I	E	C	I	E	C	I
	Period 1: 1989-1993			Period 2: 1993-1998			Period 3: 1998-2003			Period 4: 2003-2008			Period 5: 2008-2014		
Age group 15-19	0.3	1.7	0.0	-1.2	-8.4	0.3	5.0	-8.6	1.0	14.3	0.5	0.3	3.2	-2.3	-0.5
Age group 20-24	-9.3	16.7	-2.4	3.9	-8.1	-0.3	0.9	11.6	-0.1	2.5	2.2	0.0	10.1	14.1	2.2
Age group 25-29	3.4	10.0	0.9	-1.5	4.1	-0.1	-3.3	21.8	0.6	-2.7	5.8	-0.2	-5.7	14.2	-1.6
Age group 30-34	-1.1	10.8	-1.3	3.8	-10.4	-1.8	1.9	3.2	-0.2	-2.3	18.4	-1.8	-0.1	3.8	0.0
Age group 35-39	-1.5	-3.1	-0.5	8.7	26.2	-5.3	10.3	11.8	2.8	0.1	-8.6	0.0	2.3	1.8	-0.2
Age group 40-44	-2.3	-1.6	-0.1	-3.1	-0.4	0.0	-14.2	-4.5	0.6	-9.5	-5.6	-0.7	-2.4	-2.8	-0.2
Age group 45-49	-0.8	-13.3	-0.4	-0.7	5.9	0.1	-6.0	-7.7	0.5	15.9	-2.9	0.5	-3.1	-6.9	-0.5
IMR	0.0	1.8	0.0	-1.6	6.3	-1.0	-1.2	-43.6	1.9	12.5	-47.4	-22.8	1.9	4.8	1.6
U5MR	0.6	9.9	-0.5	1.4	-20.6	2.6	0.1	21.7	-0.4	-8.7	22.2	12.1	-2.7	0.6	0.2

Figure 6.18: Demographic variables' contributions in Kenya, DHS 1989-2014

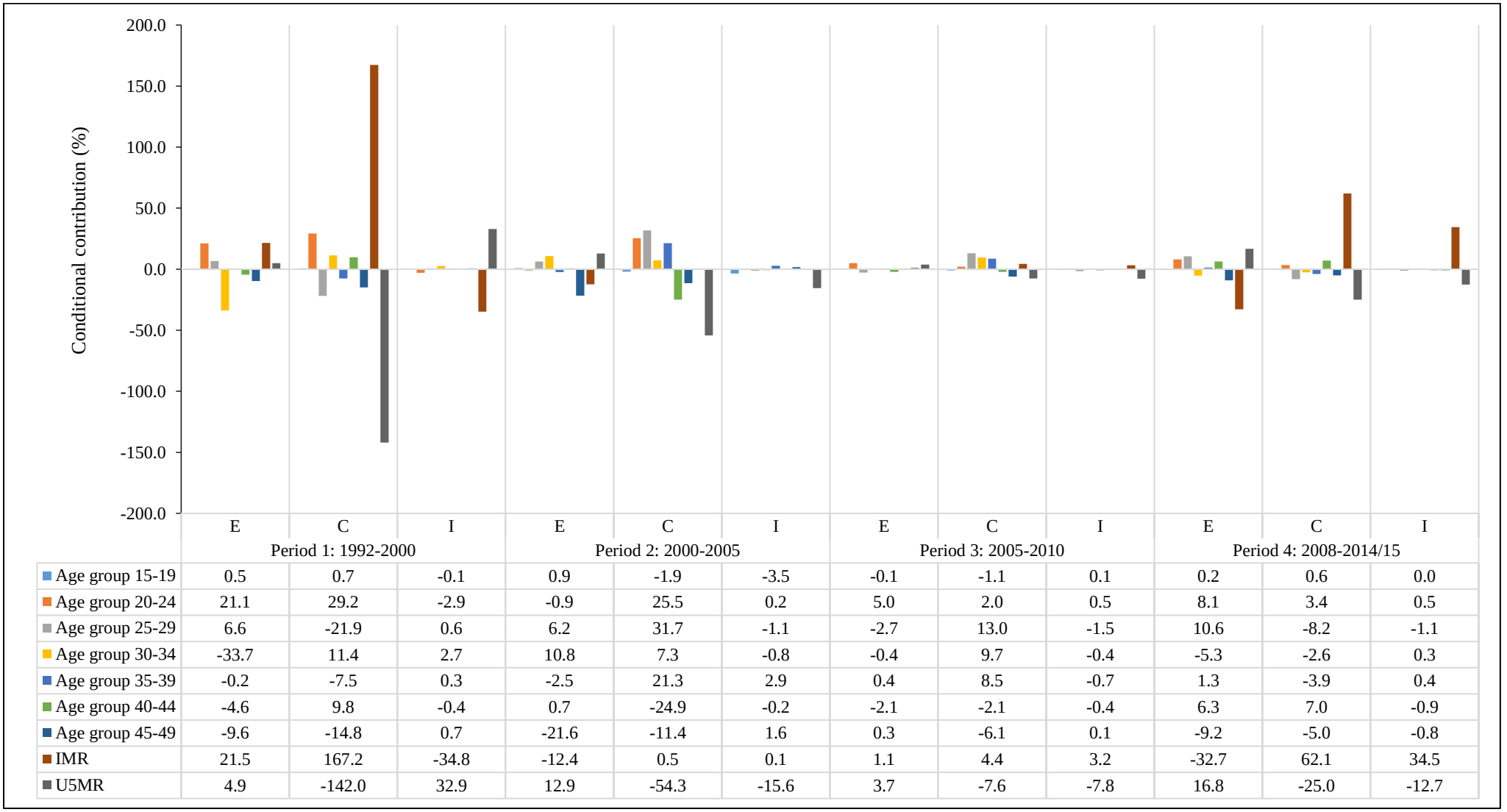
Throughout the five inter-survey periods, the largest conditional contributions came from coefficients. The results for period 1 which involved KDHS1989 and KDHS1993 show that the if the only difference between the surveys were coefficients age groups 20-24, 25-29 and 30-34, the extent of decrease in the mean ASMFR was going to be greater than 14.3-percentage-points by at least 10%. These results imply that the observed magnitude of marital fertility decrease for period 1 was not commensurate with the diminished fertility returns to the three age groups in the GDHS1993 compared to the GDHS1989. The decrease in marital fertility for Ghana's period 1 was fairly commensurate with what the change in the IMFR between GDHS1989 and GDHS1993 would have caused if the period did not experience any other change. The conditional effect of CMR was greater compared to that of IMR. Looking at period 2, age groups 15-19, 20-24 and 30-34 as well as CMR were not supportive of the decrease in marital fertility between the 1993 and 1998 GDHS surveys. The changes in the coefficients of these age groups and CMR would have reduced the magnitude of fertility decrease by magnitudes ranging from 8.1% (15-19) to 20.6% (CMR). Meanwhile, the 35-39-year age group had a positive impact on the decrease in fertility from both changes in coefficients (26.2%) and endowments (8.7%).

It has already been highlighted that Kenya's period 3 was the only inter-survey period to post an increase in the marital fertility rates. The conditional contributions of the demographic variables to this increase shed light on the potential sources to this apparent stalling of Kenya's marital fertility transition. Based on the results reported in Figure 8.18, the fertility returns to the age groups 20-24 (11.6%), 25-29 (21.8%) and 35-39 (11.8%) in particular imply that restricting differences between the KDHS1998 and KDHS2003 to the coefficients of these age groups only would have resulted in a greater magnitude of increase in the mean ASMFR. This means that the increased fertility returns to these age groups contributed to stalling. It is

noteworthy that all three decomposition components of the 35-39-year age group favoured stalling Kenya's period 3. It is shown in Figure 6.18 that fertility responses to IMFR in Kenya's period 3 did not support the stalling of marital fertility transition.

The results for Kenya's period 4 results reflect lower conditional contributions of the coefficients of the 20-24 and 25-29-year age groups while those of the 30-34-year age group increased compared to the preceding period 3. There were higher conditional contributions of the endowments in period 4 than period 3 especially with regards to the 15-19 and 45-29-year age groups which favoured an even greater magnitude of decrease in the mean ASMFR between KDHS2003 and KDHS2008. However, because these age groups constituted a small proportion of the sample, their compositional changes have limited influence on fertility decline. The last period for Kenya which posted the largest inter-survey decrease in the mean of ASMFRs between the KDHS2008 and KDHS2014 was characterised by small conditional contributions from the coefficients of IMR, CMR and all the categories of age group except 20-24 and 25-29 years. The small conditional contributions for period 5 can be regarded as reflecting that marital fertility decreased by a margin commensurate with changes in demographic endowments and associated coefficients.

The results on the conditional contributions of demographic variables to the marital fertility transition of Rwanda suggest mixed implications of the changes in endowments and coefficients of these variables for the first two periods. The change in coefficients for IMR and age groups 20-24, 30-34 and 40-44 years yielded positive conditional percentages. This means that the fertility returns to IMR and the three age groups potentially contributed to the increase in marital fertility between RDHS1992 and RDHS2000.



	Period 1: 1992-2000			Period 2: 2000-2005			Period 3: 2005-2010			Period 4: 2008-2014/15		
	E	C	I	E	C	I	E	C	I	E	C	I
Age group 15-19	0.5	0.7	-0.1	0.9	-1.9	-3.5	-0.1	-1.1	0.1	0.2	0.6	0.0
Age group 20-24	21.1	29.2	-2.9	-0.9	25.5	0.2	5.0	2.0	0.5	8.1	3.4	0.5
Age group 25-29	6.6	-21.9	0.6	6.2	31.7	-1.1	-2.7	13.0	-1.5	10.6	-8.2	-1.1
Age group 30-34	-33.7	11.4	2.7	10.8	7.3	-0.8	-0.4	9.7	-0.4	-5.3	-2.6	0.3
Age group 35-39	-0.2	-7.5	0.3	-2.5	21.3	2.9	0.4	8.5	-0.7	1.3	-3.9	0.4
Age group 40-44	-4.6	9.8	-0.4	0.7	-24.9	-0.2	-2.1	-2.1	-0.4	6.3	7.0	-0.9
Age group 45-49	-9.6	-14.8	0.7	-21.6	-11.4	1.6	0.3	-6.1	0.1	-9.2	-5.0	-0.8
IMR	21.5	167.2	-34.8	-12.4	0.5	0.1	1.1	4.4	3.2	-32.7	62.1	34.5
U5MR	4.9	-142.0	32.9	12.9	-54.3	-15.6	3.7	-7.6	-7.8	16.8	-25.0	-12.7

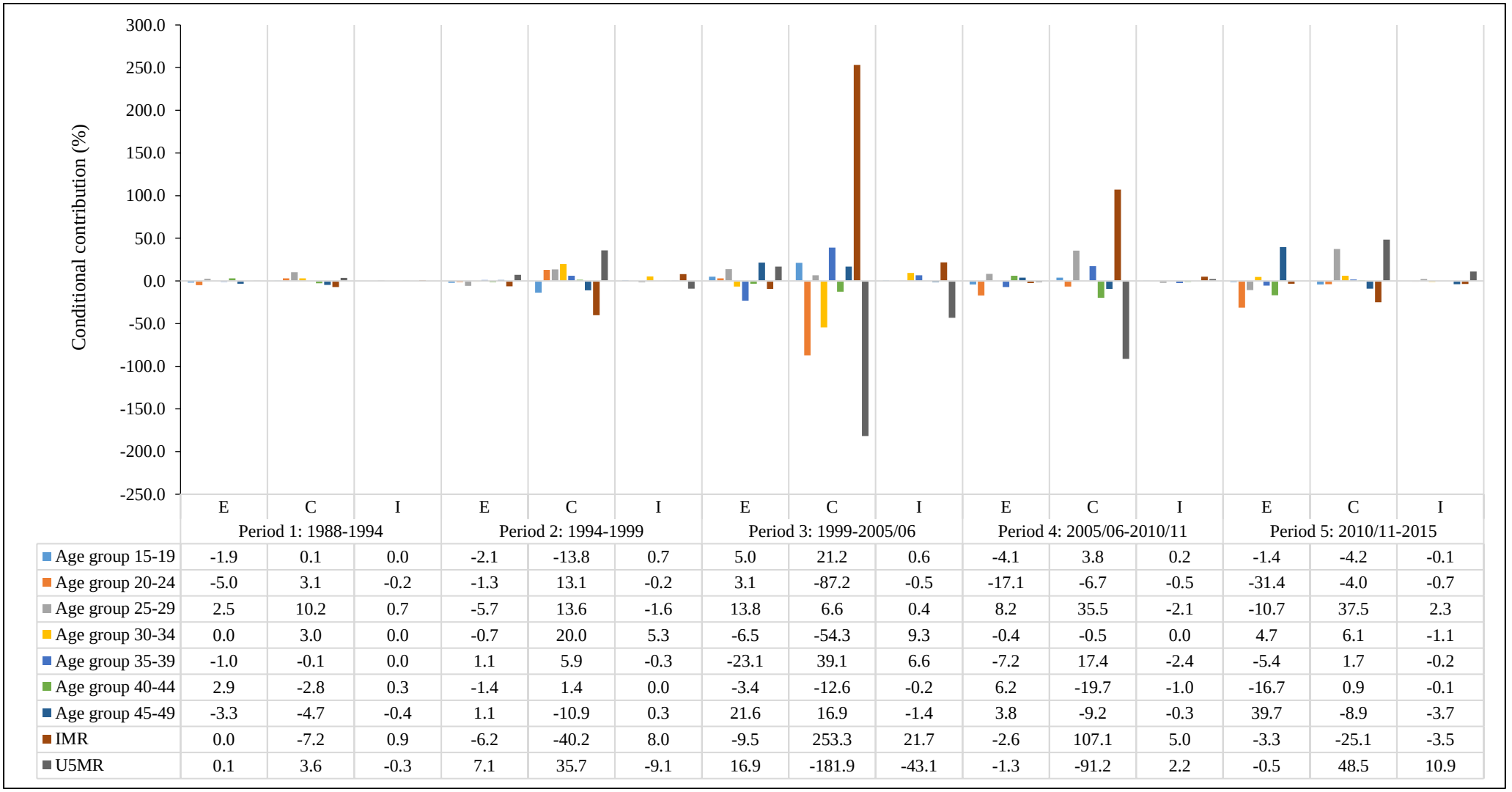
Figure 6.19: Demographic variables' contributions in Rwanda, DHS 1992-2014/15

The endowments effects of the 20-24-year age group (21.1%) and IMR (21.5%) also yielded positive conditional percentage contributions implying fertility enhancing impact for Rwanda's period 1. The fertility enhancing effects of the coefficients for the three age groups and IMR as well as endowments were countered by opposing forces from the coefficients of CMR, 25-29 and 45-49-year age groups as well as the endowments effect of the 30-34-year age group which operated to hold back the increase of marital fertility for period 1. There were other similar fertility inhibiting effects from the other variables as presented in the other sections for proximate, female, male and socioeconomic and geographic variables which contributed to ensuring that the mean of ASMFRs did not increase by more than 15.4-percentage-points between RDHS1992 and RDHS2000.

The conditional contributions of coefficients to the increase on mean ASMFR for Rwanda's period 2 were on average greater compared to period 1. The age groups from 20-24 to 35-39 years where fertility rates were mostly highest had increased fertility returns in the RDHS2005 compare to the RDHS2000. The increased fertility returns to these age groups yielded conditional percentage contributions ranging from 7.3% (30-34) to 31.7% (25-29) implying that 5.3-percentage-points increase in the mean ASMFR in period 2 was not large enough to absorb the force from the coefficients of these age groups. The changes in the compositional characteristics of the 30-34-year age group also yielded a positive force supporting the increase in marital fertility. There was virtually no conditional contribution from coefficients for IMR while that from CMR (-54.3) signified that if period 2 was characterised by changes in the fertility returns to CMR, the magnitude of increase in marital fertility would have been half of the observed 5.3-percentage-points.

There were relatively lower conditional contributions of demographic variables in period 3 compared to the preceding period 2. The largest conditional percentage contribution was from the change in the coefficients of the 25-29-year age group (13%) which favoured greater decrease in fertility than the observed. The generally small conditional contributions of demographic variables to the decline in marital fertility in period 3 signify that the onset of marital fertility transition in Rwanda was in line with the forces coming from these variables. To an extent, this was also the case with period 4 although the coefficients for most age groups and CMR operate to reduce the pace of fertility decline. A notable conditional contribution that favoured even greater magnitude of decrease than the observed 11.1-percentage-points came from the coefficients associated with IMR (62.1%). Looking at the overall picture for Rwanda, the inter-survey increases and decrease in marital fertility for the first two periods and period 4 were mostly not commensurate with the driving forces from changes in endowments and coefficients. It was only period 3 with its generally very low conditional percentage contributions that suggested the magnitude and direction of marital fertility change that was agreeable to the temporal changes in the compositional characteristics and coefficients of demographic variables.

The conditional contributions of demographic variables to the temporal inter-survey marital fertility changes for Zimbabwe were largest in period 3 followed by period 4 and lowest in period 1. As shown in Figure 8.20 below, all the conditional contributions of endowments and associated fertility returns were well below 10% except for the coefficients for the 25-29-year age group (10.2%). The small conditional contributions from all the decomposition components in period 1 means that the large percentage-points decrease in the mean ASMFR between ZDHS1988 and ZDHS1994 imply that the changes occurring in the country were in sync with pace of marital fertility decrease.



	Period 1: 1988-1994			Period 2: 1994-1999			Period 3: 1999-2005/06			Period 4: 2005/06-2010/11			Period 5: 2010/11-2015		
	E	C	I	E	C	I	E	C	I	E	C	I	E	C	I
Age group 15-19	-1.9	0.1	0.0	-2.1	-13.8	0.7	5.0	21.2	0.6	-4.1	3.8	0.2	-1.4	-4.2	-0.1
Age group 20-24	-5.0	3.1	-0.2	-1.3	13.1	-0.2	3.1	-87.2	-0.5	-17.1	-6.7	-0.5	-31.4	-4.0	-0.7
Age group 25-29	2.5	10.2	0.7	-5.7	13.6	-1.6	13.8	6.6	0.4	8.2	35.5	-2.1	-10.7	37.5	2.3
Age group 30-34	0.0	3.0	0.0	-0.7	20.0	5.3	-6.5	-54.3	9.3	-0.4	-0.5	0.0	4.7	6.1	-1.1
Age group 35-39	-1.0	-0.1	0.0	1.1	5.9	-0.3	-23.1	39.1	6.6	-7.2	17.4	-2.4	-5.4	1.7	-0.2
Age group 40-44	2.9	-2.8	0.3	-1.4	1.4	0.0	-3.4	-12.6	-0.2	6.2	-19.7	-1.0	-16.7	0.9	-0.1
Age group 45-49	-3.3	-4.7	-0.4	1.1	-10.9	0.3	21.6	16.9	-1.4	3.8	-9.2	-0.3	39.7	-8.9	-3.7
IMR	0.0	-7.2	0.9	-6.2	-40.2	8.0	-9.5	253.3	21.7	-2.6	107.1	5.0	-3.3	-25.1	-3.5
U5MR	0.1	3.6	-0.3	7.1	35.7	-9.1	16.9	-181.9	-43.1	-1.3	-91.2	2.2	-0.5	48.5	10.9

Figure 6.20: Demographic variables' contributions in Zimbabwe, DHS 1988-2015

Period 2 saw a general increase in the conditional contributions of coefficients for all the demographic variables. The coefficients for age groups 20-24 (13.1%), 25-29 (13.6%), 30-34 (20%) and CMR (25.7%) favoured a greater magnitude of marital fertility decrease than the observed 12.2-percentage-points. The fertility returns to the other age groups and IMR favoured a smaller decrease in fertility in period 2.

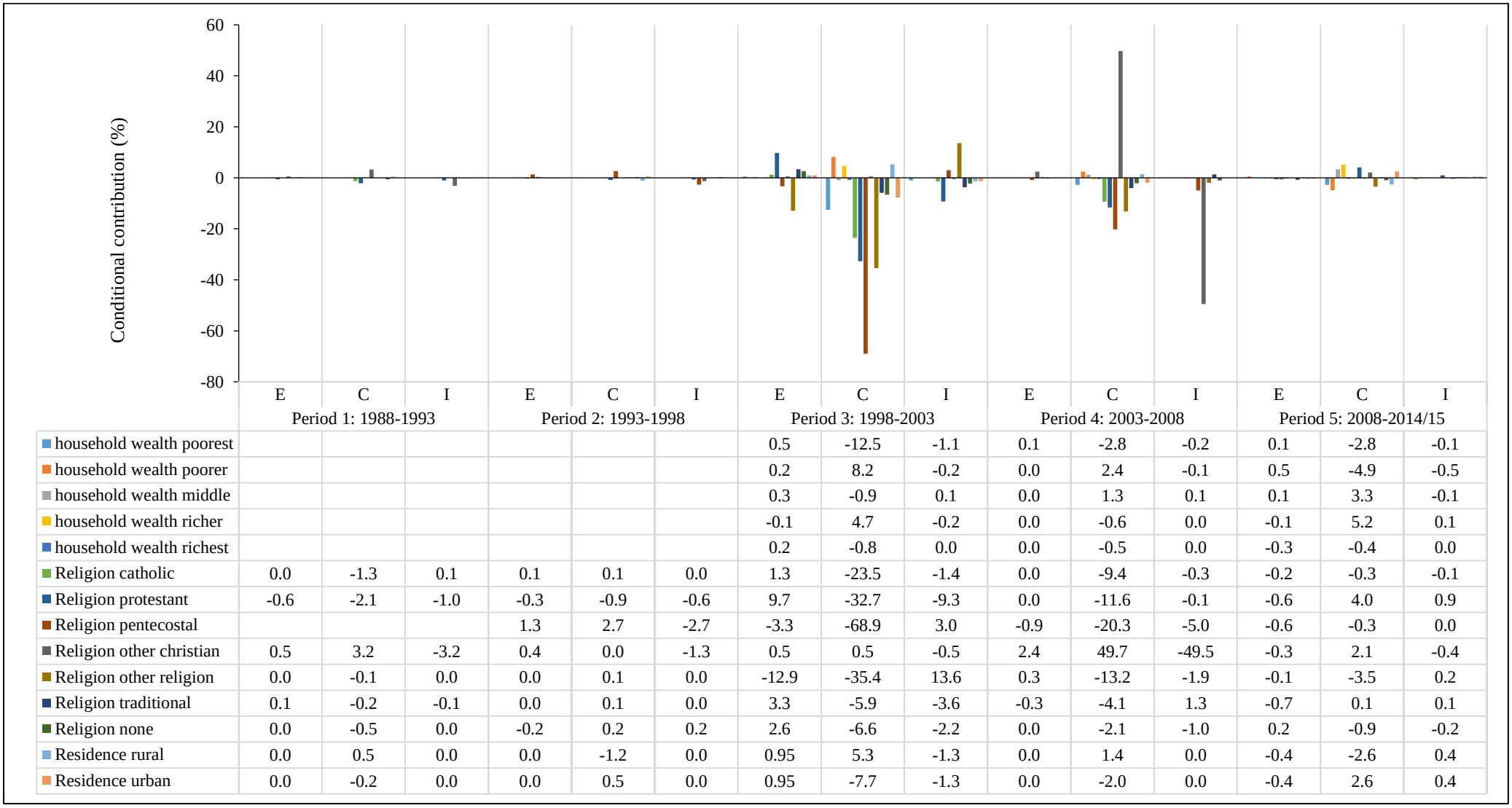
The results for Zimbabwe's period 3 showed the largest disjuncture between the forces of demographic variables and the actual decrease of 2.7-percentage-points between the ZDHS1999 and ZDHS2005/06. The coefficients for age groups 15-19 (21.2%) 35-39 (39.1%), 45-49 (16.9%) and IMR (253.3%) favoured a greater decrease in marital fertility with IMR yielding the largest conditional force. Compositional characteristics pertaining to the 25-29 (13.8%) and 45-49 (21.6%)-year age groups, and CMR (16.9%) also favoured a greater magnitude of decrease in marital fertility than what occurred. However, there were also notable negative forces that operated to hold back fertility decline. These came from the coefficients for three age groups namely 20-24 (-87.2%), 30-34 (-54.3%) and 40-44 (-12.6%), and CMR (-181.9%). The pooled force of these age groups and CMR would have actually resulted in the increase in marital fertility in period 3. Considering the tempo of fertility, period 3 results were arguably a pre-cursor to the increase in marital fertility by 6.2-percentage-points in period 4.

The conditional contribution of IMR (107.1%) for Zimbabwe's period 4 was less than half of that for period 3 and likely signified that the trajectory and magnitude of marital fertility change between the ZDHS2005/06 and ZDHS2010/11 shifted towards that favoured by IMR. Meanwhile, if the surveys involved in period 4 were differentiated by fertility returns to community-level CMR alone, the magnitude of increase in the mean AMSFR was going to be

91.2% less than 6.2-percentage-points. There were only two age groups, 25-29 (35.5%) and 35-39 (17.4%) that had conditional percentage effects that would have notably increase the gap between the means of ASMFRs of the 2005/06 and 2010/11 ZDHS surveys. Looking at period 5, notable conditional percentage contributions of coefficients were for the 25-29-year age group (37.5%), IMR (-25.1%) and CMR (48.5%). The changes in the fertility returns to the 25-29-year age group and CMR favoured greater magnitude of increase in marital fertility between the ZDHS2010/11 and ZDHS2015 while those for IMR would have reduced 25% the extent of marital fertility increase. Zimbabwe's period 5 results showed some notable conditional contributions from changes in compositional characteristics. These were in relation to the 20-24 (-31.4%), 25-29 (-10.7%) and 40-44 (-16.7%) which would have reduced the extent of marital increase by at least 10%.

6.3.5 Socioeconomic and geographic variables' contributions to marital fertility trends

The conditional contributions of religion and place of residence to for the first two inter-survey periods of Ghana were all mostly close to zero for all the three decomposition components. As shown in Figure 6.21 below, changes in the endowments and coefficients did not yield conditional percentages that reflect that religion and place of residence would have changed the magnitude of marital fertility decrease in the 1988-1993 and 1993-1998 periods. There were also very small conditional contributions from household wealth, religion and place of residence in period 5 implying that the changes in these variables' compositional characteristics and coefficients were in sync with the increase in marital fertility between the GDHS2008 and GDHS2014/15.

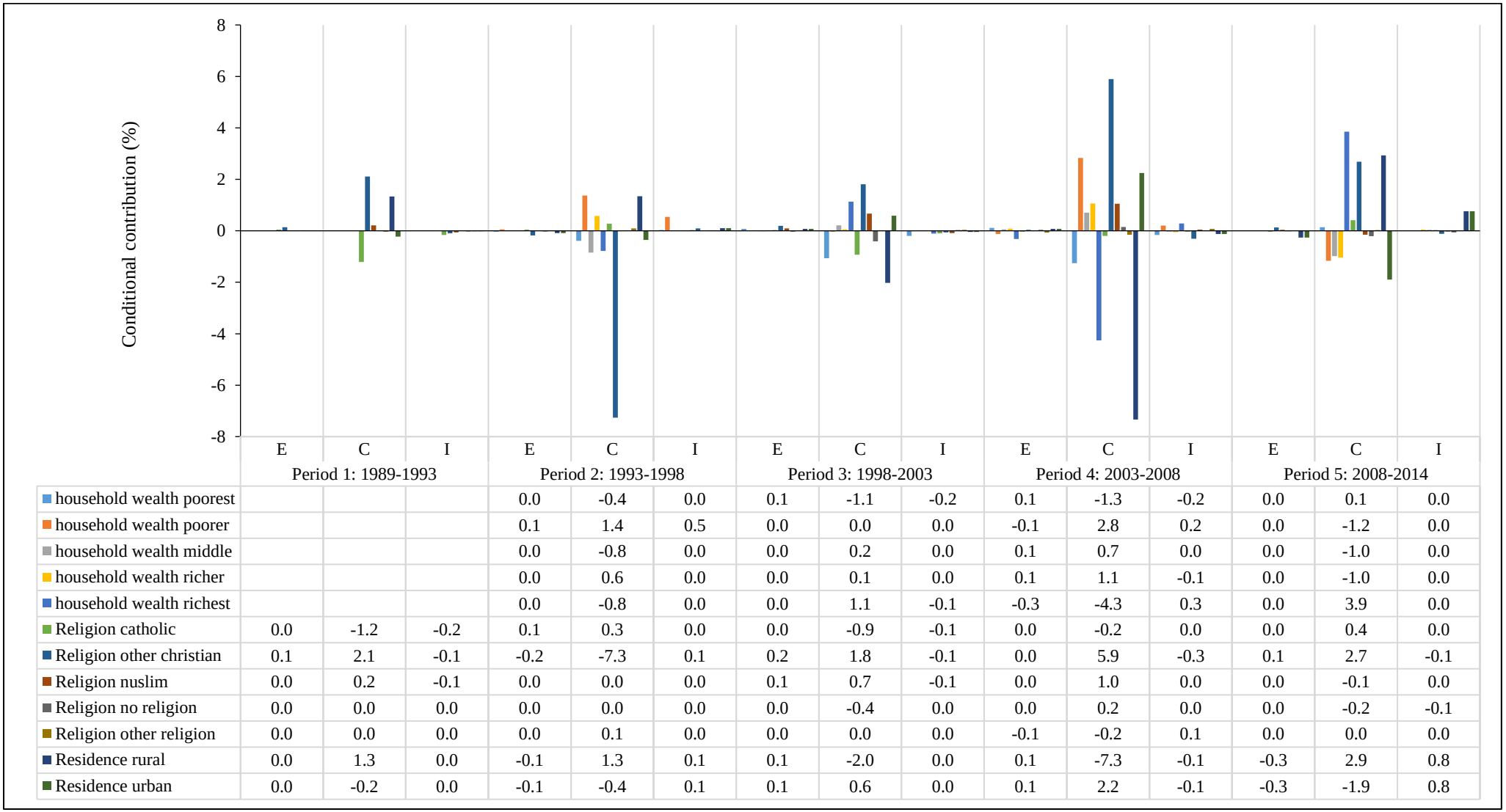


	Period 1: 1988-1993			Period 2: 1993-1998			Period 3: 1998-2003			Period 4: 2003-2008			Period 5: 2008-2014/15		
	E	C	I	E	C	I	E	C	I	E	C	I	E	C	I
household wealth poorest							0.5	-12.5	-1.1	0.1	-2.8	-0.2	0.1	-2.8	-0.1
household wealth poorer							0.2	8.2	-0.2	0.0	2.4	-0.1	0.5	-4.9	-0.5
household wealth middle							0.3	-0.9	0.1	0.0	1.3	0.1	0.1	3.3	-0.1
household wealth richer							-0.1	4.7	-0.2	0.0	-0.6	0.0	-0.1	5.2	0.1
household wealth richest							0.2	-0.8	0.0	0.0	-0.5	0.0	-0.3	-0.4	0.0
Religion catholic	0.0	-1.3	0.1	0.1	0.1	0.0	1.3	-23.5	-1.4	0.0	-9.4	-0.3	-0.2	-0.3	-0.1
Religion protestant	-0.6	-2.1	-1.0	-0.3	-0.9	-0.6	9.7	-32.7	-9.3	0.0	-11.6	-0.1	-0.6	4.0	0.9
Religion pentecostal				1.3	2.7	-2.7	-3.3	-68.9	3.0	-0.9	-20.3	-5.0	-0.6	-0.3	0.0
Religion other christian	0.5	3.2	-3.2	0.4	0.0	-1.3	0.5	0.5	-0.5	2.4	49.7	-49.5	-0.3	2.1	-0.4
Religion other religion	0.0	-0.1	0.0	0.0	0.1	0.0	-12.9	-35.4	13.6	0.3	-13.2	-1.9	-0.1	-3.5	0.2
Religion traditional	0.1	-0.2	-0.1	0.0	0.1	0.0	3.3	-5.9	-3.6	-0.3	-4.1	1.3	-0.7	0.1	0.1
Religion none	0.0	-0.5	0.0	-0.2	0.2	0.2	2.6	-6.6	-2.2	0.0	-2.1	-1.0	0.2	-0.9	-0.2
Residence rural	0.0	0.5	0.0	0.0	-1.2	0.0	0.95	5.3	-1.3	0.0	1.4	0.0	-0.4	-2.6	0.4
Residence urban	0.0	-0.2	0.0	0.0	0.5	0.0	0.95	-7.7	-1.3	0.0	-2.0	0.0	-0.4	2.6	0.4

Figure 6.21: Contributions of socioeconomic and geographic variables, Ghana DHS 1988-2014/15

The third and fourth periods for Ghana had considerable conditional percentage contributions from mainly the changes in the coefficients associated with some religion groups. For period 3, the changes in the coefficients associated with being Catholic (-23.5%), Protestant (-32.7%), Pentecostal (-68.9%) and other religion (-35.4) when fertility increased imply that fertility returns to women in these religious groups decreased between the 1998 and 2003 GDHS surveys. These would have reduced the magnitude of marital fertility increase in period 3. Meanwhile, considerable conditional contributions of coefficients for period 4 were observed for Pentecostal (-20.3%), other religion (-13.2%) and Protestant (-11.6%) and these operated to hold back the decrease in fertility while other Christian (49.7%) favoured an even greater magnitude of marital fertility decline.

Household wealth status, religion and place of residence showed very little conditional contributions to the inter-survey decreases and increase in the means of AMSFRs for all five periods in Kenya. The results presented in Figure 6.22 show that for all the periods the conditional contributions were below 10% for endowments, coefficients and interaction. The results for the socioeconomic and geographic variables show that the compositional changes and associated fertility returns found commensurate changes in the marital fertility rates between surveys. These variables would not have affected the inter-surveys differences in marital fertility levels if they represented the only differences between surveys.

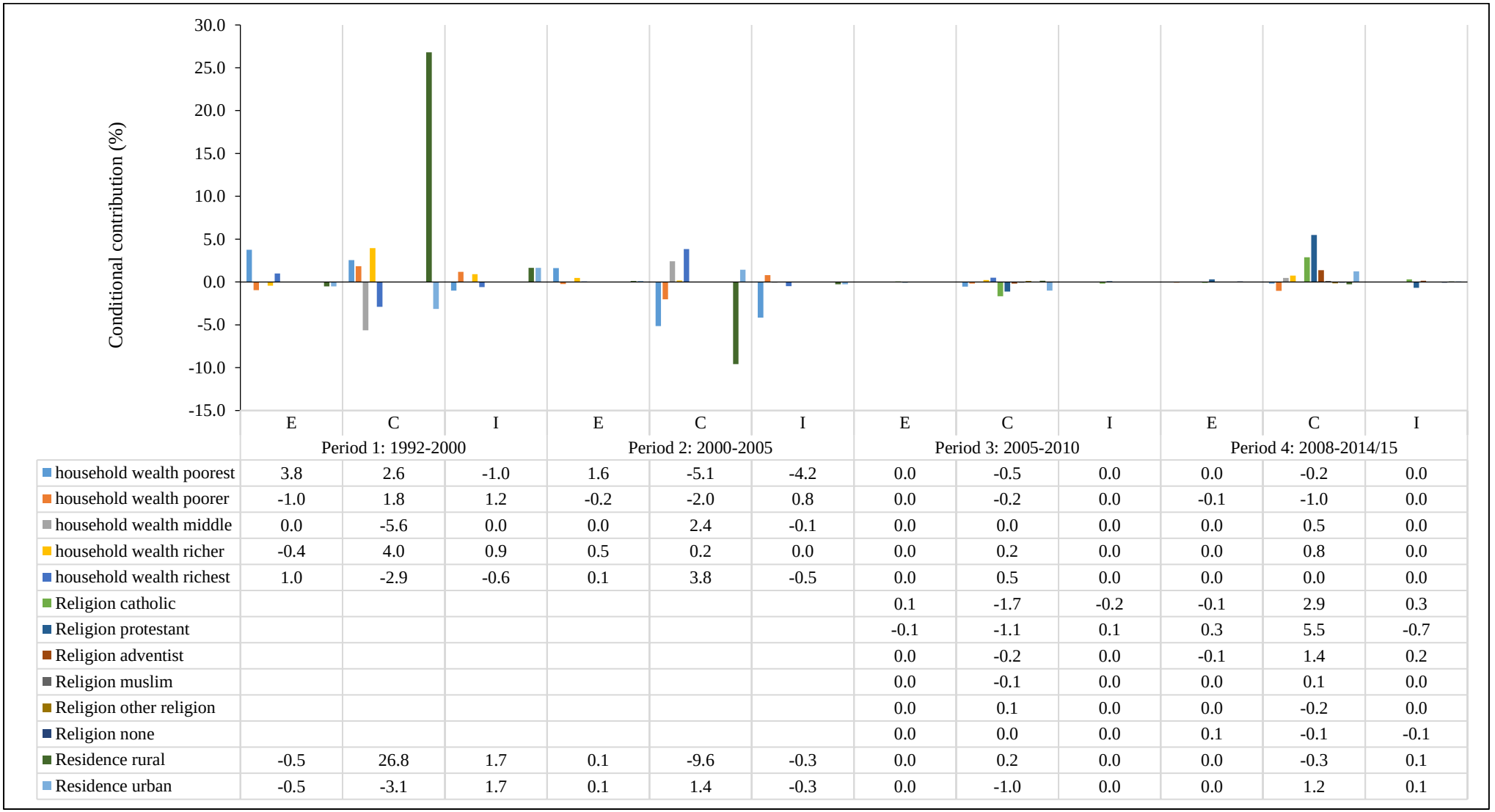


	E	C	I	E	C	I	E	C	I	E	C	I	E	C	I
	Period 1: 1989-1993			Period 2: 1993-1998			Period 3: 1998-2003			Period 4: 2003-2008			Period 5: 2008-2014		
household wealth poorest				0.0	-0.4	0.0	0.1	-1.1	-0.2	0.1	-1.3	-0.2	0.0	0.1	0.0
household wealth poorer				0.1	1.4	0.5	0.0	0.0	0.0	-0.1	2.8	0.2	0.0	-1.2	0.0
household wealth middle				0.0	-0.8	0.0	0.0	0.2	0.0	0.1	0.7	0.0	0.0	-1.0	0.0
household wealth richer				0.0	0.6	0.0	0.0	0.1	0.0	0.1	1.1	-0.1	0.0	-1.0	0.0
household wealth richest				0.0	-0.8	0.0	0.0	1.1	-0.1	-0.3	-4.3	0.3	0.0	3.9	0.0
Religion catholic	0.0	-1.2	-0.2	0.1	0.3	0.0	0.0	-0.9	-0.1	0.0	-0.2	0.0	0.0	0.4	0.0
Religion other christian	0.1	2.1	-0.1	-0.2	-7.3	0.1	0.2	1.8	-0.1	0.0	5.9	-0.3	0.1	2.7	-0.1
Religion nuslim	0.0	0.2	-0.1	0.0	0.0	0.0	0.1	0.7	-0.1	0.0	1.0	0.0	0.0	-0.1	0.0
Religion no religion	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.4	0.0	0.0	0.2	0.0	0.0	-0.2	-0.1
Religion other religion	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	-0.1	-0.2	0.1	0.0	0.0	0.0
Residence rural	0.0	1.3	0.0	-0.1	1.3	0.1	0.1	-2.0	0.0	0.1	-7.3	-0.1	-0.3	2.9	0.8
Residence urban	0.0	-0.2	0.0	-0.1	-0.4	0.1	0.1	0.6	0.0	0.1	2.2	-0.1	-0.3	-1.9	0.8

Figure 6.22: Contributions of socioeconomic and geographic variables, Kenya DHS 1989-2014

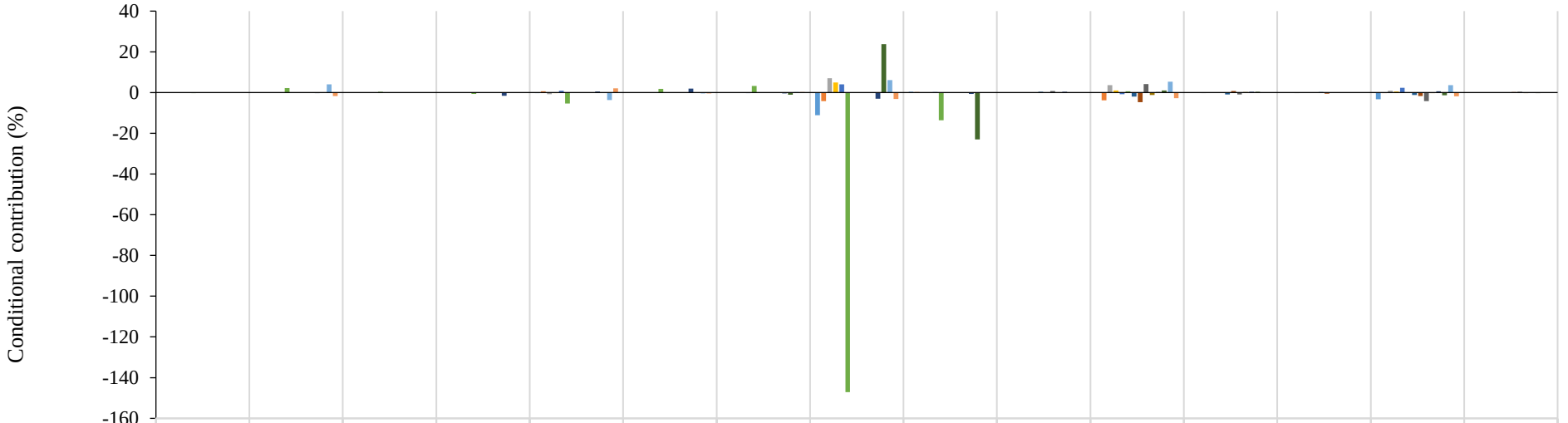
The conditional contributions of household wealth, religion and place of residence to the temporal marital fertility changes in Rwanda were mostly close to zero just like in Kenya. The results reported in Figure 6.23 below show that all conditional percentages were considerably below 10% except for the coefficients associated in rural residence for period 1 (26.8%) and period 2 (-9.6%). These percentage contributions from rural residence highlight that the increases in marital fertility rates that prevailed in the first two inter-survey periods in Ghana were not commensurate with the forces coming from all the variables. Marital fertility rates for the 1992-2000 and 2000-2005 periods did not increase in a manner consistent with that favoured by the changes especially in fertility returns to rural residence. The onset of marital fertility transition and the ensuing rapid falls in fertility rates post 20005 was shown to be consistent with driving forces from changing compositional characteristics and coefficients. This is because the extent of marital fertility decline in Rwanda's period 3 and 4 satisfied the driving forces of socioeconomic and geographic factors.

The results on the conditional percentage contributions of socioeconomic and geographic variables in Zimbabwe were comparable to those found in Rwanda in terms of being mostly close to zero. As shown in Figure 6.24, notable conditional contributions were observed in period 3 only. This was the period that experienced the least change in marital fertility and the large conditional percentage contributions imply the potential importance of the household wealth and religion variables. The changes in the coefficients for those from households in the lowest wealth quantile (-11.2%) and Catholic (-147.1%) favoured fertility increase in period 3.



	Period 1: 1992-2000			Period 2: 2000-2005			Period 3: 2005-2010			Period 4: 2008-2014/15		
	E	C	I	E	C	I	E	C	I	E	C	I
household wealth poorest	3.8	2.6	-1.0	1.6	-5.1	-4.2	0.0	-0.5	0.0	0.0	-0.2	0.0
household wealth poorer	-1.0	1.8	1.2	-0.2	-2.0	0.8	0.0	-0.2	0.0	-0.1	-1.0	0.0
household wealth middle	0.0	-5.6	0.0	0.0	2.4	-0.1	0.0	0.0	0.0	0.0	0.5	0.0
household wealth richer	-0.4	4.0	0.9	0.5	0.2	0.0	0.0	0.2	0.0	0.0	0.8	0.0
household wealth richest	1.0	-2.9	-0.6	0.1	3.8	-0.5	0.0	0.5	0.0	0.0	0.0	0.0
Religion catholic							0.1	-1.7	-0.2	-0.1	2.9	0.3
Religion protestant							-0.1	-1.1	0.1	0.3	5.5	-0.7
Religion adventist							0.0	-0.2	0.0	-0.1	1.4	0.2
Religion muslim							0.0	-0.1	0.0	0.0	0.1	0.0
Religion other religion							0.0	0.1	0.0	0.0	-0.2	0.0
Religion none							0.0	0.0	0.0	0.1	-0.1	-0.1
Residence rural	-0.5	26.8	1.7	0.1	-9.6	-0.3	0.0	0.2	0.0	0.0	-0.3	0.1
Residence urban	-0.5	-3.1	1.7	0.1	1.4	-0.3	0.0	-1.0	0.0	0.0	1.2	0.1

Figure 6.23: Contributions of socioeconomic and geographic variables, Rwanda DHS 1992-2014/15



	E	C	I	E	C	I	E	C	I	E	C	I	E	C	I
	Period 1: 1988-1994			Period 2: 1994-1999			Period 3: 1999-2005/06			Period 4: 2005/06-2010/11			Period 5: 2010/11-2015		
household wealth poorest				-0.1	-0.3	0.0	-0.2	-11.2	0.3	-0.1	0.2	0.0	0.0	-3.2	0.1
household wealth poorer				0.0	0.6	0.0	-0.1	-4.2	0.3	0.0	-3.8	0.0	-0.1	-0.3	0.0
household wealth middle				0.0	-0.9	0.0	-0.1	7.1	0.1	0.1	3.6	-0.3	-0.2	0.8	0.1
household wealth richer				0.0	-0.3	0.0	0.0	5.0	0.0	0.0	1.1	0.0	0.0	0.6	0.0
household wealth richest				0.0	0.9	0.0	-0.2	4.0	0.3	0.1	-0.8	0.0	0.0	2.3	0.0
Religion catholic	-0.3	2.2	0.4	-0.6	-5.4	1.8	3.2	-147.1	-13.7	-0.1	0.6	0.2	-0.1	0.1	0.0
Religion protestant										0.4	-2.0	-1.0	0.3	-1.2	-0.2
Religion pentecostal										-0.2	-4.7	0.7	-0.5	-1.7	0.3
Religion apostolic										0.8	4.2	-1.0	-0.1	-4.2	0.4
Religion other christian										0.1	-1.2	0.3	0.0	-0.3	-0.2
Religion other religion	-0.1	-0.3	0.1	-1.5	0.5	2.0	-0.4	-3.0	-0.7	0.4	0.2	0.4	-0.1	0.6	0.1
Religion none	0.0	-0.1	0.1	-0.1	0.0	0.0	-1.1	23.7	-22.9	-0.2	1.1	0.4	0.2	-1.4	-0.2
Residence rural	0.0	4.1	-0.1	0.0	-3.7	-0.3	0.2	6.1	-0.2	0.0	5.3	0.0	0.0	3.6	0.0
Residence urban	0.0	-1.8	-0.1	0.0	2.1	-0.3	0.2	-3.2	-0.2	0.0	-2.7	0.0	0.0	-1.8	0.0

Figure 6.24: Contributions of socioeconomic and geographic variables, Zimbabwe DHS 1988-2015

6.3.6 The contributions of unobservables in marital fertility transitions

The residuals which are captured in the constant as part of coefficients measure the pooled conditional effect of factors that were not included in the decomposition equation. Having presented in the preceding sections the individual results for each of the variables included in this study, this section provides results on the conditional effects of the unobservables. The results presented in Figure 6.25 below show that the pooled effects of unobservables were less than 90% for all the countries. The conditional effects for Ghana, Kenya and Zimbabwe favoured even greater magnitudes of fertility decrease in both period 1 and 2 while that for Rwanda operated to reduce the extent of marital fertility increase in period 2. It should be noted that period 2 for Rwanda in Figure 6.25 was the first inter-survey period as presented in the preceding sections.

The conditional percentages of the residuals for period 3 were the highest compared to the other periods especially for Ghana, Rwanda and Zimbabwe while for Kenya it was the lowest. This period was characterised by increases in marital fertility rates in Ghana, Kenya and Rwanda and marginal decrease in Zimbabwe. The large conditional percentage contributions of the residuals thus imply that marital fertility did not increase by magnitudes commensurate with the driving forces from unobservables in Ghana, Kenya and Rwanda while the decrease in Zimbabwe was not large enough. There were greater magnitudes of fertility in period 4 and 5 compared to period 1 and the conditional contributions of the residuals were smaller in these two periods compared to period 3. This signifies that in times of notable fertility changes, unobserved factors tended to pull in the same direction as those included in the analytical models.

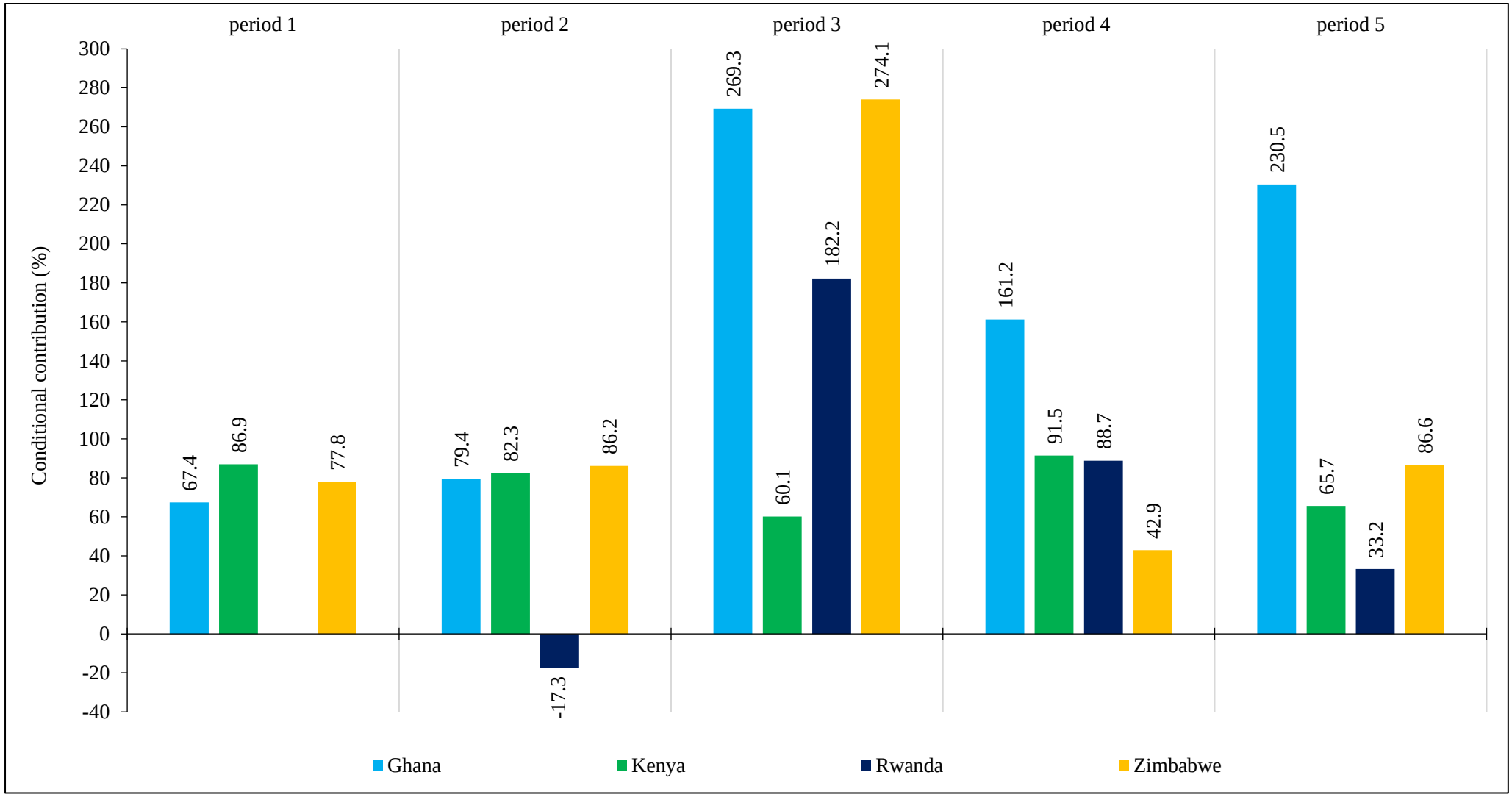


Figure 6.25: Contributions of the effects of unobservables to marital fertility transitions in Ghana, Kenya, Rwanda and Zimbabwe

6.3.7 Relative contributions of male and female variables

The relative contributions of the comparable male and female characteristics in the marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe show some interesting results pertaining to how these operated to affect the direction and magnitude of inter-survey increases and decreases of the mean ASMFRs. These results are shown in Figure 6.26 below. The scales of the x-axis were standardised to allow for inter-country comparisons hence the minimum of -160% and a maximum of 100% for the four graphs.

The conditional contributions of the educational attainment, occupation and desire for more children aggregated by sex were generally in the same direction. There were instances where divergence in the pulling forces occurred. A case in point was period 1 for Ghana where the coefficients for female characteristics supported the decrease in marital fertility rates while those for men operated to reverse the decline in marital fertility. Similar observations were made for Rwanda period 1 and periods 2, 3 and 5 for Zimbabwe. For periods 3 and 5 in Zimbabwe, the changes in the marital fertility returns to husband's characteristics were not favourable to the increases in fertility. The results for Rwanda show that the tendency for male and female characteristics to influence marital fertility in opposing forces diminished with time once marital fertility transition was underway. A common theme across the four countries is that disparities in the marital fertility enhancing or inhibiting effects of the endowments and coefficients were more defined for periods characterised by stalling, especially of the fertility-increase type. The conditional contributions the coefficients for males were generally greater than females' in Ghana and Zimbabwe while the opposite appeared to be true for Kenya and Rwanda. These results highlight that attaining synchronisation of male and female variables' effects on marital fertility changes may potentially enhance the pace of the transitions.

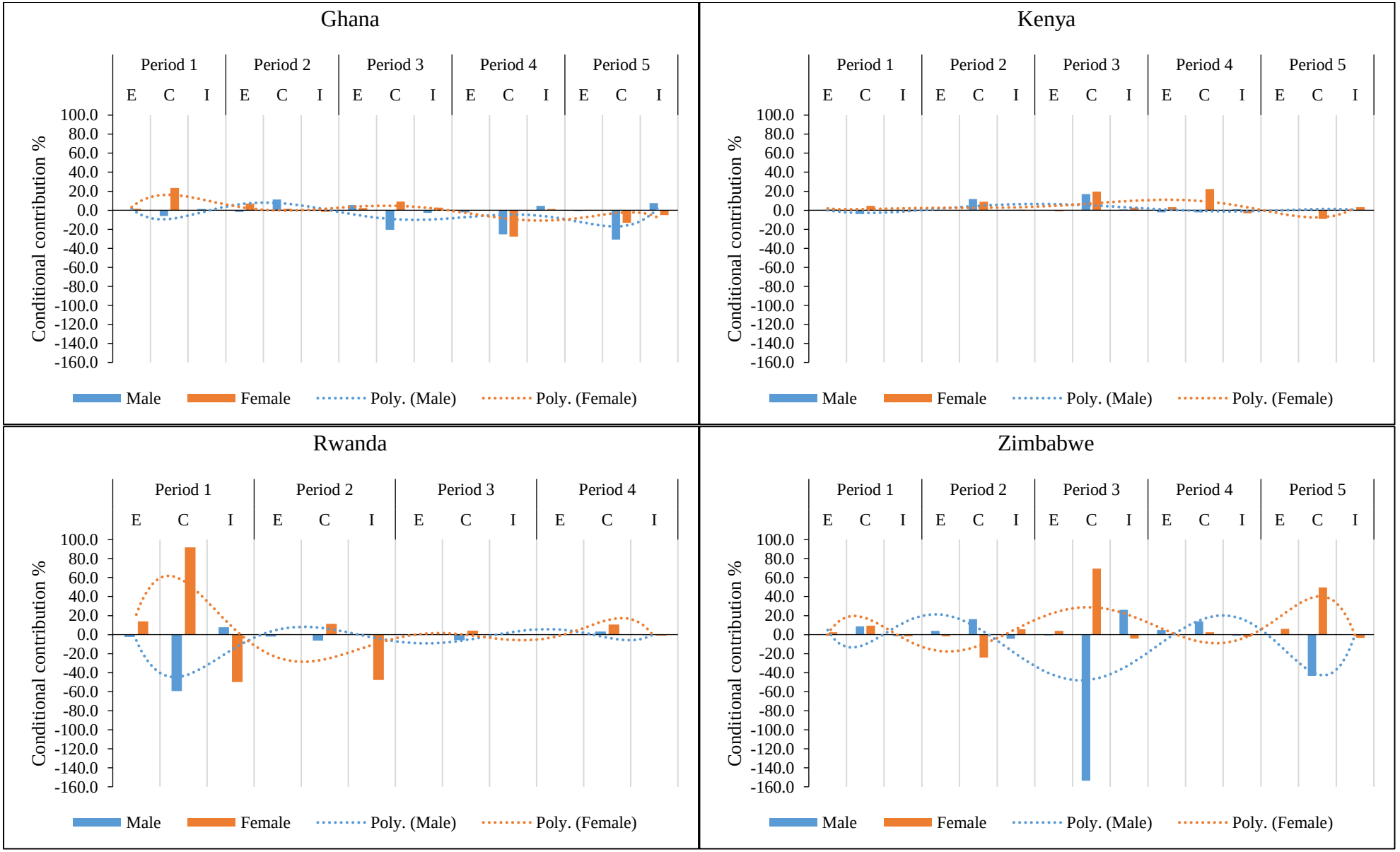


Figure 6.26: Relative conditional contributions of male and female variables to the inter-survey increases and decreases of marital fertility rates

6.3.8 The major drivers of marital fertility changes

The sections 6.3.1 to 6.3.5 presented the detailed conditional contributions of independent variables according to their different categories. This section brings together all the individual variables to report on the determinants that have played major roles in the marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe. The results shown in Figures 6.27 to 6.30 below address the fifth specific research question of the study. The interpretation of the reported conditional percentages is similar to that used in the preceding sections. However, it is worth noting that the major drivers of the temporal marital fertility changes are represented by small conditional percentages. As previously explained, the small conditional percentages indicate that a variable's depressing or enhancing effect on the temporal change of marital fertility was reflected in the actual observed decrease or increase. In the case of a variable returning a high conditional contribution, the implication is that its downward or upward pulling effect on marital fertility was not absorbed in the actual change. The variables associated with large conditional percentages can be interpreted as representing their potential to influence greater increase or decrease in the marital fertility rates.

As in the preceding section, the Figures 6.27-6.30 have the x-axis standardised to enhance comparative analysis of the similarities and differences in the drivers of the marital fertility transitions across the countries. For each categorical variable, the results indicate the total contribution of the changes in compositional characteristics and effects. For example, looking at education, the reported conditional percentages reflect the total contribution from shifts in the distribution of the samples across the four levels of education status. As was the case with the detailed results reported in the previous sections, the changes in endowments were more reflected in the actual inter-survey decreases and increases of marital fertility than coefficients which tended to imply that there was potential for more rapid transitions.

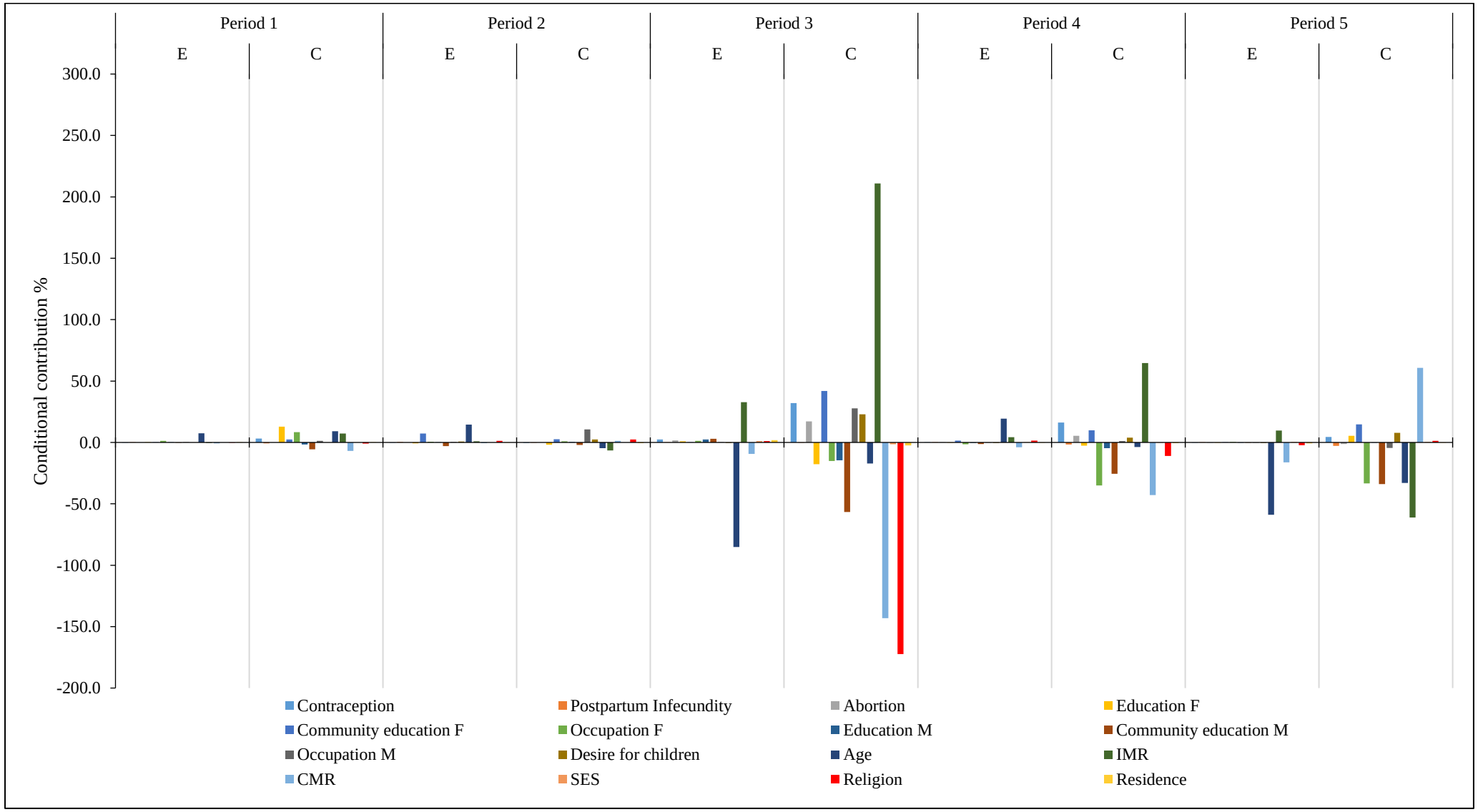


Figure 6.27: The pooled relative contributions of the proximate and background determinants on marital fertility changes in Ghana, 1988-2014.

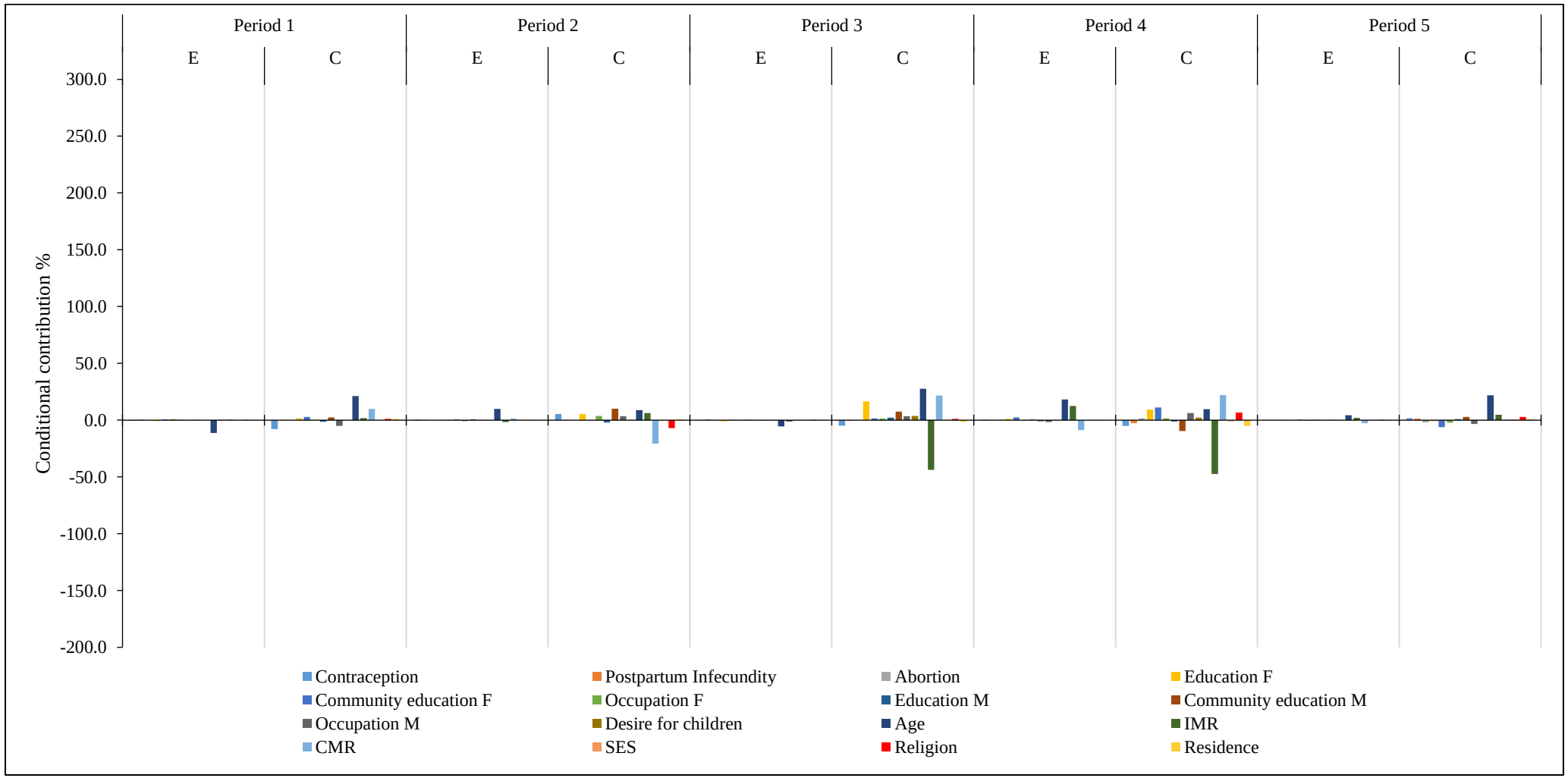


Figure 6.28: The pooled relative contributions of the proximate and background determinants on marital fertility changes in Kenya, 1989-2014

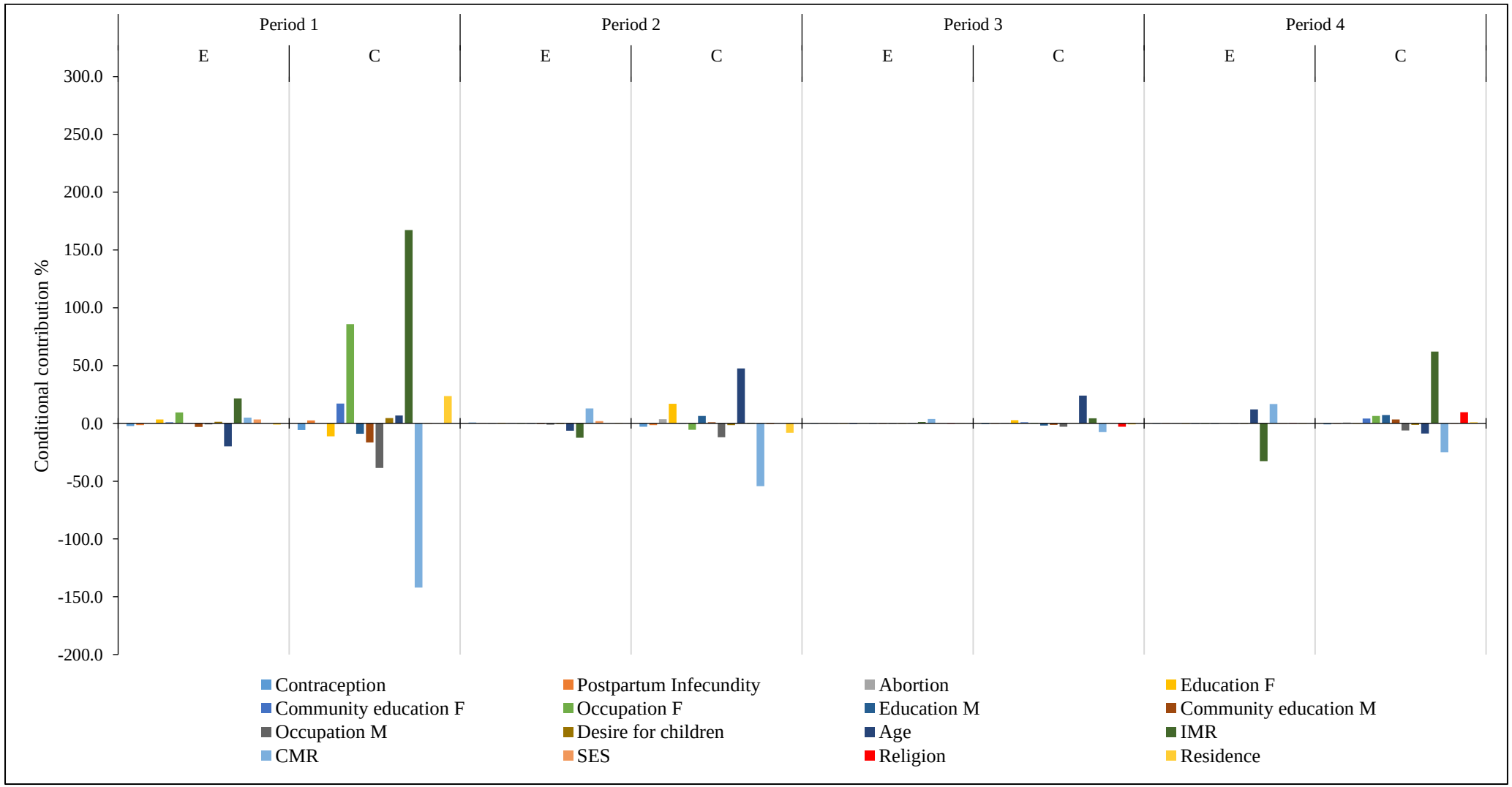


Figure 6.29: The pooled relative contributions of the proximate and background determinants on marital fertility changes in Rwanda, 1992-2014

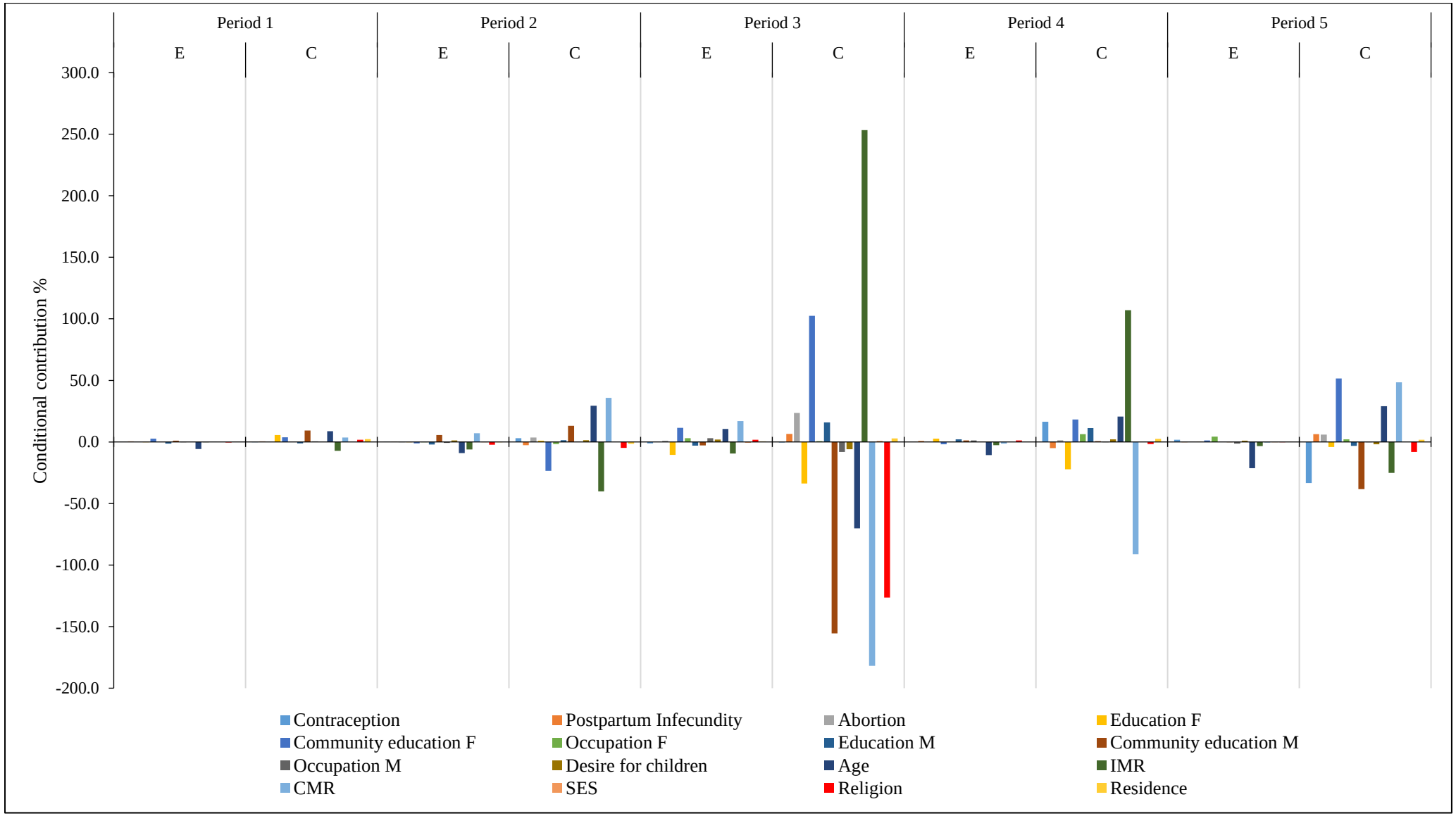


Figure 6.30: The pooled relative contributions of the proximate and background determinants on marital fertility changes in Zimbabwe, 1988-2015

An overall observation of the results for four countries shows that the variables included in the analysis were more effective in explaining the actual marital fertility transitions in Kenya compared to the other three countries. For Ghana and Rwanda, the findings indicate more effective role of both proximate and indirect determinants during periods of marital fertility decreases as was also the case for Zimbabwe. Focusing on Figure 6.27, one can observe that all compositional changes had a depressing effect on marital fertility with conditional percentages close to zero for Ghana's period 1. This was mostly the case for coefficients although the fertility returns to some variables like female education and occupation decreased by magnitudes that would have resulted in larger declines in marital fertility. There were related results for period 2 and period 3 although for the latter it was the endowments effect for all the variables excluding age and IMR. Ghana's period 3 and to a less extent periods 4 and 5 showed large conditional contributions of the changes in coefficients to the temporal increases and limited decreases in marital fertility rates. It can be recalled that these periods were associated with stalling of marital fertility transition in Ghana. Nonetheless, the results in Figure 6.27 indicate that the major drivers of Ghana's marital fertility transition were the endowments effect of contraception, postpartum infecundity, male occupation, desire for children, male education, religion and female education. These variables were associated with negligible conditional percentages for the endowments component.

The results for Kenya differed from those of Ghana, Rwanda and Zimbabwe as most of the endowments and coefficients effects were more in sync with the observed changes in marital fertility although coefficients still had relatively larger percentages than endowments. With the exception of changing age structure of the married female sample, Figure 6.28 shows that all the proximate and background variables were important in driving the temporal decreases of marital fertility rates in Kenya. A different picture was observed for Rwanda where the

temporal changes in the distribution of married sample were instrumental in the rapid decline of marital fertility rates in period 3 with both endowments and coefficients being mostly effective. This was the only instance in Rwanda and across all the four countries when the marital fertility inhibiting effects of temporal changes in endowments were in tandem with the impact of changes in coefficients. The coefficients for religion, CMR and male occupation were however not supportive of the rapid falls in marital fertility rates for Rwanda's period 3. The increase in the marital fertility rates of Rwanda in the first two inter-survey periods were supported by most of the independent variables except the age distribution of the women and male education which favoured fertility decreases.

The first inter-survey period for Zimbabwe which was characterised by rapid declines in marital fertility showed very small condition contributions of all the variables. However, the conditional contributions of the endowments returned negative percentages except community-level of female education. In the second period, the compositional changes in contraceptive use patterns, IMR and males' community-level education operated to reverse the decrease in marital fertility while the changes in the rest of the other variables supported fertility decrease. There was evidence of growing disjuncture between actual changes in marital fertility rates and the impact of changing returns to characteristics (coefficients) for period 3 but the endowments effect of female community-level education, CMR, religion and female occupation were more in tandem with the observed magnitude of decrease in marital fertility. The overall observation for Zimbabwe is that the endowments effect of contraceptives, female community-level education, individual-level male education and postpartum infecundity were more instrumental in driving marital fertility transition.

6.4. Chapter summary

This chapter presented findings from decomposition analysis which estimated the conditional contributions of the independent variables to the marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe. Judging by the residual force of the respective decomposition components of endowments and coefficients, the temporal decreases in marital fertility rates were mainly driven by compositional changes. The coefficients also played a role at some periods and were shown to provide the greatest window of opportunity to achieve faster declines of marital fertility rates. The sample distributional changes in proximate determinants in the early periods were more prominent in driving marital fertility declines in Ghana and Zimbabwe with the opposite occurring in Rwanda while Kenya displayed a constant pattern over time. Similar patterns were observed for female and male background variables as well as the other classes of determinants. The changes in compositional characteristics were more effective in explaining the decrease in marital fertility across all the four countries than stalling of transitions. It is concluded from this chapter that while the time-mediated changes in the composition of the married samples have been closely linked to the observed trends of the marital fertility rates of Ghana, Kenya, Rwanda and Zimbabwe, the temporal changes in fertility returns to endowments have the greatest potential to hasten fertility decline in SSA if conducive macro conditions can be put in place by the countries.

CHAPTER 7 : DISCUSSION OF RESULTS

7.1. Introduction

The goal of this research was to identify the drivers of fertility change over time in sub-Saharan Africa (SSA) using the cases of Ghana, Kenya, Rwanda ad Zimbabwe. The research employed a four-tier methodology designed to address each of the study's specific objectives. This interprets the results by drawing on points of convergence and divergence with existing literatures as well as explaining the meaning of the results of the current study. The structure of the chapter follows the chronological presentation of the research findings. The first section discusses the marital fertility trends of the four countries. The second section discusses the determinants of marital fertility differentials as obtained from random effects regression analysis. The third section of the chapter discusses the results from decomposition analyses which examined the driving forces of temporal fertility changes.

7.2. Marital fertility trends: the falls, the stalls and the resumptions

The results presented in chapter 4 showed that for all the four countries, there were temporary increases in marital fertility rates that preceded the onset of fertility transition. The increase in marital fertility rates before the start of fertility transition is not a novel finding per se. Previous studies of fertility have highlighted this for most countries from SSA with respect to TFRs which are heavily influenced by TMFRs (Bulatao and Casterline, 2001; Korotayev et al., 2016; Saito, 2006). The temporary increase in fertility that precedes the commencement of fertility transition has been found to be due to various factors. Korotayev et al. (2016) explored the fertility dynamics of countries in tropical Africa and found that societies from this region had the capacity to increase rates of childbearing at the start of economic development because some of the sex taboos associated with postpartum abstinence are discarded. In this regard,

secularisation which is an integral concept of the demographic transition theory and often associated with inhibiting effects on fertility firstly operates to provide a basis for increased fertility. Dyson and Murphy (1985) reported that less intensive and shortened breastfeeding durations contributed to predecline increases in fertility rates in both the developed and developing world. The urbanisation process is highly associated with circularisation and contributes to the decrease in the average number of months of postpartum abstinence (Tabutin et al., 2004). Studies from other parts of the world like Asia and Latin America observed that the increase in birth spacing in these regions played a crucial role in kick-starting fertility transition hence the onset of fertility decline without having a period of increased rates (Korotayev et al., 2016). This was not the case in all the countries investigated in this study because SSA societies already had on average long birth intervals due to postpartum abstinence (Korotayev et al., 2016).

This study found variations in the nature of the marital fertility transitions of the four countries with each country showing a unique trend. This is consistent with previous findings which showed that the nature of fertility trends vary markedly across countries from SSA as well as those from other regions (Askew et al., 2017; Casterline, 2001; Saito, 2006). The study by Askew et al. (2017) showed the differences in the TFR trends of Ghana and Kenya as well as the associated trends in the contraceptive prevalence rates (CPR) of the two countries. Kenya experienced a stall in the rising trend of CPR between 1998 and 2003 while for Ghana stalled between 2003 and 2008 (Askew et al., 2017). The differences in the trends of fertility determinants across SSA countries as established in previous studies can therefore be argued to be an underlying factor in the unique marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe reported in this study. The socio-political history of Rwanda for instance, arguably played an important role in shaping the marital fertility profile of Rwanda in the 1990s

and 2000s decades. The economic crisis and civil war in the early 1990s which culminated in the 1994 genocide adversely impacted on the family planning infrastructure resulting in most women being unable to access contraceptives and health services. This arguably contributed to the stalling of marital fertility transition in Rwanda. The role of the disruption of long-standing socioeconomic and political environments on marital fertility transition can also be argued to have transpired in Zimbabwe as a result of the FTLRP especially over the 2006-2011 period when stalling occurred. During this period, Zimbabwe experienced hyperinflation and the disintegration of most social infrastructures including the public health system which supplies most of the family planning services to the majority of the population. The occurrence of stalling during this period in Zimbabwe was therefore potentially due to the adverse changes in the macro socioeconomic environment.

In all the four countries investigated in this study, reconstructed annual trends showed that the onset of fertility transition was preceded by a short period of increases in marital fertility rates. In this regard, the current research findings were consistent with those from existing literature which argue that the erosion of the traditional fertility inhibiting postpartum practices precede the spread in the adoption of modern contraceptive methods thus resulting in fertility rates rising (Schoumaker, 2017).

The existing body of literature cites mass access to formal education, female labour-force participation, family planning movement and urbanisation as components of the macro transformations that drive the rapid decreases in total fertility rates (Colleran et al., 2014; Murthi, 2002). These factors can also be extended to account for the behaviour of marital fertility rates once they start on their transitions inasmuch as the trends in TFRs in most African

countries are heavily influenced by TMFRs. It is worth pointing out that the explanations of marital fertility transitions citing development and associated factors as the driving forces of observed trends speak to the postulations of the demographic transition theory. The demographic transition theory posits that development brings urbanisation, and accessibility of vital technological advances implying that increasing members of the population have access to birth control information and means. Consequently, more couples are in a position to limit the number of children they have. The use of contraceptives due to acceptance and willingness to apply modern methods of birth control which takes shape in urban areas before spreading to rural communities attest to the postulations of ideational change theory. The onset of development has attendant sociocultural transformations which contribute to the weakening of pro-natal attitudes thus predisposing an increasing proportion of populations to desire lower fertility.

The rapid decreases in the fertility rates were not sustained for long enough periods to enable the countries to reach replacement level rates. The results reported from Chapter 5 showed that all the four countries studied have experienced different forms of stalling of marital fertility transitions. At some instances, stalling took the form of lack of sufficient decrease while at other instances it was characterised by increases in marital fertility for a number of years. The occurrence and forms of stalling in Ghana, Kenya, Rwanda and Zimbabwe as shown in trends presented in Chapter 5 confirm findings from various previous studies (Bongaarts, 2008; Garenne, 2008a; Gries and Grundmann, 2015; Moultrie et al., 2008; Shapiro and Gebreselassie, 2009). While these studies investigated TFRs, the contribution from the current research is to shed light on the underlying properties of TFRs which have been responsible for the stalls that have been observed. A study based on this thesis was able to reveal that the stall of TFR

declines experienced in Zimbabwe was in fact stalls in marital fertility and has little to do with fertility occurring outside marriages (Ndagurwa and Odimegwu, 2019).

7.3. Determinants of cross-sectional marital fertility differentials

The analysis from multilevel models returned mixed results regarding the significance of proximate determinants on fertility differentials among married women. In Ghana, Kenya and Rwanda, use of traditional methods of contraception and increase in community-level duration of postpartum infecundity were associated with significant decreases in marital fertility. The capacity of these variables to explain cross-sectional differentials in marital fertility rates is consistent with findings from previous studies (Bongaarts, 2017, 2015; Chola and Michelo, 2016; Palamuleni, 2017). Palamuleni (2017) investigated determinants of fertility transition in Namibia with a focus on the role of proximate determinants. He found that contraceptive use had a large suppressing effect on fertility (Palamuleni, 2017). Considering that the effects of contraception can be fully appraised in social institutions of continued exposure to sexual intercourse, the fertility inhibiting impact of contraception found in the current study are testament to the postulations of Bongaarts' (2015, 1978) fertility model of proximate determinants. Chola and Michelo (2016) analysed the 2007 Zambian Demographic and Health Survey to estimate the fertility effects of proximate factors and also found that postpartum infecundity had a significant impact on reducing fertility from reaching natural level.

The results showing significant marital fertility differentials in Ghana, Kenya, Rwanda and in some instances Zimbabwe due to proximate determinants were consistent with the postulations of the theory of proximate determinants of fertility in its original and revised versions (Bongaarts, 2015, 1994, 1978). According to Bongaarts (2015), contraceptive use and longer

durations of postpartum infecundity are predictors of lower fertility and can explain differences in the fertility levels among women. While this theory has been proved and applied on many occasions, its postulations were not always supported by the results from the current study as well as some of the existing literatures. The current study found insignificant fertility effects of use of modern contraceptives on marital fertility rates on several of the DHS surveys examined namely 2003 and 2014-15 KDHS surveys, 2014 GDHS survey, 1992 and 2005 RDHS surveys. In Zimbabwe, the results for four out of the six ZDHS surveys – 1988, 1999, 1994 and 2005/06 – provided evidence suggesting that modern contraceptives did not account for cross-sectional differences in marital fertility rates. These results showed consistence with those reported by Chola and Michelo (2016) who also found that contraception played a limited role in inhibiting fertility from reaching natural level. Despite the results from the current study appearing to be counterintuitive in suggesting modern contraceptive enhancing effects on fertility, the findings are consistent with previous related research.

There are reasons why proximate factors like contraception were not always significant predictors of marital fertility differentials in this study if one refers to findings from previous studies by Udjo (1996) and Ngome and Odimegwu (2014). One of these reasons is that contraceptives can be used by married women as a replacement for traditional methods of birth spacing and not to stop childbearing. The use of contraceptives without any changes in desired family size may thus not lead to significant reductions in marital fertility rates commensurate with the prevalence of modern contraception. The study by Udjo (1996) investigated the fertility transition of Zimbabwe for the pre-1995 period using multivariate regression models and found that contraceptive use was an significant factor in fertility decline. The same study found that most users of contraceptives were above 30 years old, had at least five births and used contraception for birth stopping while non-users of contraceptives were younger women

who still had low parities (Udjo, 1996). This means that the fertility transition of Zimbabwe was driven more by higher-parity reductions in the older age groups. This explains why stalling of marital fertility transition occurred at high TMFRs in Zimbabwe and potentially in the other SSA countries.

The results from the current study corroborate findings from Udjo (1996) having observed in three of the six ZDHS surveys positive associations between marital fertility rates and use of modern contraceptives. This positive association emanates from the fact older women who use contraceptives have already achieved high parities compared to their younger non-user counterparts which gives the impression that contraceptives lead to higher fertility. The results from Ngome and Odimegwu's (2014) study on adolescents from Zimbabwe found that those with higher fertility had the least odds of using contraceptives. Given young ages (15-19) of the sample in Ngome and Odimegwu's (2014) study, the negative association between fertility and contraceptive use corroborates earlier findings by Udjo (1996) which showed non-use of birth control methods by young women.

The current study found that the fertility effects of proximate factors changed over time in all the four countries and that proximate determinants did not always have the same negative or positive impact on marital fertility. At some stages, modern contraception was associated with higher fertility while age at first union and average duration of postpartum infecundity were adversely related to marital fertility. These confirm those from previous studies like Wamukoya et al. (2016) and Finlay et al. (2018) which investigated fertility in general. The study by Wamukoya et al. (2016) analysed data from the Nairobi Cross-sectional Slum Survey 2000-2012 and found that the effects of proximate determinants changed over time. According to

Wamukoya et al. (2016), the inhibiting effects of the index of marriage was largest in the year 2000 while in 2012 the largest effect came from contraceptive use. Finlay et al. (2018) investigated the role of proximate determinants on TFR differentials in 21 countries from SSA using DHS data. Their study observed the delay in marriage coupled with small increases in the prevalence of modern contraceptive use provided a significant impact on the fertility transitions of those from the rich wealth quantiles (Finlay et al., 2018). On the contrary, the most important determinants of the fertility transitions of those from poor wealth quantiles were postpartum abstinence and breastfeeding (Finlay et al., 2018). Given that wealth status is an indirect determinant of fertility, the findings from Finlay et al. (2018) can be argued to suggest that trends in the socioeconomic outlook have played an important role in fertility transitions. This is because the macro environment creates the conditions that can enable the proximate determinants to be effective inhibitors of fertility or otherwise. Consequently, the findings from this thesis as well as those from previous research need to be understood in the light of the changing sociocultural and economic contexts within which proximate determinants operate.

The multivariate regression models returned positive associations between the increase in education status and the average ASMFR in most of the DHS surveys from Ghana, Kenya and Zimbabwe. The increase in average ASMFR with education status may be considered counter-intuitive and inconsistent with established knowledge about fertility effects of education whereby less educated women are expected to have higher fertility rates. A closer look at these results however, shows that these findings are in fact consistent with previous research findings (Kirk and Pillet, 1998; Kravdal, 2012, 2002). As shown in the age distribution of marital fertility rates chapter 6, the peak of ASMFRs for Ghana, Kenya and Zimbabwe mostly occurred below 25 years. In all these countries, there were greater proportions of younger women with

secondary or higher educational attainment while among the older women there were greater proportions with primary education or less. Given that this study used an age standardised indicator of marital fertility which peaks in the 17-24 years age bracket, it should be expected that ASMFRs increase with educational attainment because they measure recent fertility and not cumulative fertility (CEB). Therefore, because of the greater representation of young women among the more educated and concentrated within the age range of peak fertility, it leads to positive associations being observed between SAMFRs and education. this was not observed in Rwanda in the early surveys before the onset marital fertility transition when the overwhelming majority of the women had little or no education.

The regression results also revealed strong negative associations between age and ASMFR especially in Ghana, Kenya and Zimbabwe, while for Rwanda there were both positive and negative associations. The negative associations highlight the potential occurrence of unplanned unions in these countries because they imply that young women aged 15-19 years are having highest birth rates in the years leading up to a survey. Previous research identified premarital pregnancies as a major causal factor of union formation in SSA. For example, Mutanana and Mutara (2015) and Sibanda (2011) have stated that teenage girls and young women from countries like Zimbabwe mostly enter into marriages as a result of falling pregnant. Consequently, young women in unions are more likely to have a recent birth compared to older women.

7.4. Sources of fertility change

The results from decomposition analysis showed large conditional contributions of coefficients which measure the potential fertility returns to characteristics while those for endowments were

mostly small. The coefficients component of the threefold Oaxaca-Blinder decomposition as applied in this study estimated the effects of the temporal changes in the reproductive behaviours of the different segments of the samples of the married women which yielded either an increase or decrease in marital fertility rates. Because the Oaxaca-Blinder decomposition returns results that are conditional, the model highlights variables and reproductive behaviours that had the greatest potential to impact on fertility change. In the same vein, the small conditional contributions such as those observed for endowments at the aggregate and detailed levels of decomposition in the marital fertility trends that prevailed in Ghana, Kenya, Rwanda and Zimbabwe highlighted the variables which produced the driving forces that were reflected in the actual decrease or increase in marital fertility. This approach to interpreting decomposition results leads to the observation that changes in the compositional characteristics of the samples (populations) of the four countries investigated in this study were responsible for the nature of the marital fertility transitions that were observed. This finding is to a considerable extent consistent with existing literature on fertility transitions in SSA (Ariho et al., 2018; Garenne and Joseph, 2002; Kinfu, 2000; Lindstrom and Woubalem, 2003; Rutayisire et al., 2014).

The study by Ariho et al. (2018) investigated the role of female variables to the fertility changes between the 2006 and 2011 Uganda Demographic and Health Surveys (UDHS). They found that the compositional changes involving education status and delayed age at first marriage were the most important factors in the decrease of the CEB between the 2006 and 2011 UDHS surveys (Ariho et al., 2018). Although the study by Ariho et al. (2018) used a indicator of fertility, CEB, which is different from ASMFRs, its findings are relevant to those from the current study. For instance, the conditional contributions of female educational attainment at the individual level and age at first marriage were mostly very low in Ghana, Kenya, Rwanda

and Zimbabwe especially for the periods that were characterised by significant marital fertility decreases. This implies that the marital fertility inhibiting force compositional changes emanating from increased educational attainment and the delay in first marriage was realised in the actual inter-survey decreases in marital fertility.

The importance of the delay in age at first marriage was also found by Lindstrom and Woubalem (2003) who decomposed the change in the TFR of women from Addis Ababa between 1984 and 1994. The results from the study by Lindstrom and Woubalem (2003) showed that the delay in marriage and increased control over the timing of births for women in marriages had important fertility inhibiting effects and played a major role in the decline of TFRs of Addis Ababa towards below replacement level. The increase in control over the timing of births implies access to modern birth control methods and such developments can be reflected in the average lengths of birth spacing. A look at the general outlook for SSA revealed that overall birth intervals have increased on the subcontinent and this has contributed to the decrease in fertility rates (Moultrie et al., 2012). Although the current study did not examine the role of birth intervals in the marital fertility transitions, the findings from Moultrie et al. (2012) are relevant to understanding the results reported in chapters 5 and 6. The increase in birth intervals among women exposed to sexual intercourse implies the use of contraception add this study found that contraception was one of the crucial variables that drove the decrease in marital fertility rates.

The current study found that both male and female variables returned very small conditional percentages for both endowments and coefficients for periods characterised by significant decreases of marital fertility rates but in instances of stalling male variables tended to have

greater conditional percentages. This means that the marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe benefited from the congruence between male and female characteristics in times of decreases while stalling appeared to be driven more by men than women. These results from the current study bear a relationship with the findings from previous research which sought to examine the role of men in the fertility outcomes of women in the SSA context (Dodoo, 1995; Ezeh, 1991, 1992; Hartmann et al., 2012; Kimuna and Adamchak, 2001; Mbizvo and Adamchak, 1991b; Ngome and Odimegwu, 2014; Odimegwu et al., 2015). Kimuna and Adamchak (2001) investigated couples' use of family planning in Kenya and found that male approval was associated with greater likelihood of contraceptive use. They also found that men's family size desires and the education status of both men and women were important predictors of family planning use (Kimuna and Adamchak, 2001). It can therefore be argued that the small conditional percentage contributions of male variables in the detailed results observed in the marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe for the current study imply that men had an important impact on the fertility trends of these countries.

Multivariate decomposition analysis also showed results which reflected disjuncture between changes in compositional changes and marital fertility especially for inter-survey periods characterised by stalling. At such instances, endowments particularly female characteristics favoured fertility decreases but marital fertility rates increased instead. These episodes of fertility stalling highlighted the importance of men under patriarchal social contexts which are found in SSA which have a bearing on marital fertility changes (Odimegwu et al., 2015). The dominance of males over females in reproductive decisions can find expression through domestic violence. In the study by Odimegwu et al. (2015) which examined DHS data from Gabon, Nigeria and Zambia, it was established that experiencing any form of domestic violence

was associated with higher fertility irrespective of the women's individual characteristics. The results from the current study showed that the TMFRs for Zimbabwe were on a rising trend as at the year 2014 and given the high levels of gender-based violence reported in Mukanangana et al. (2014), it can be argued that the social context of the country is indeed influencing fertility trends. A regionwide study by Cools and Kotsadam (2017) which analysed DHS data for 30 SSA countries also confirmed high rates of gender-based intimate partner violence experienced by women. The women from resource-poor communities were the more likely to experience violence in the hands of male counterparts (Cools and Kotsadam, 2017). Given that the current study's findings showed higher fertility in association with indicators of deprivation like lack of education and rural residence, it can be argued that the indifferent marital fertility transitions observed in Ghana, Kenya, Rwanda and Zimbabwe were partly due to the slow progress in eradicating violence against women.

Linked to the preceding paragraph, it can be stated that patriarchal social contexts characterised by unequal reproductive decision-making power between men and women can be seen by having reproductive behaviours being accounted for by men more than women. The current study found evidence suggesting greater influence of men on marital fertility rates compared to women especially during stalling times. In a study which focused on Ghana, Dodoo and Seal (1994) examined the sources of the disparities in male-female reproductive goals using the GDHS1988. Their study found that women with low education status were more likely to be unable to determine their fertility goals as the power to do so rested with their husbands (Dodoo and Seal, 1994). These male-female disparities have not been eradicated in Ghana with many women in the country still experiencing gender-based violence (Dery and Diedong, 2014). These previous findings corroborate the results from the current study which showed that

marital fertility failed to decline during stalling periods despite female compositional characteristics being changing in directions that favoured fertility decrease.

In understanding the trends of marital fertility rates in Ghana, Kenya, Rwanda and Zimbabwe, it is worth highlighting the macro contexts of the four countries and how these changed over time. For instance, Zimbabwe experienced an increase modern contraceptive use between the ZDHS2005/06 and ZDHS2010/11 but marital fertility did not decrease. The collapse of Zimbabwe's economy potentially diminished the effect of proximate determinants of fertility. The hyperinflationary environment of the 2006-2012 period resulted in high unemployment rates with the majority of the labour force found in the informal sector. These conditions are not favourable to marital fertility transition and could be the reason why there was stalling in Zimbabwe. It is also noteworthy considering the negative economic growth of Kenya during the 1990s decade when the annual growth rates of real gross domestic product were negative for a decade. This lack of economic growth in Kenya has been argued to have contributed to stalling of fertility in previous studies (Bongaarts, 2006).

One of the most notable conditional percentage contributions were the constants which denote a change in the intercept. A change in the constant implies that there were factors besides those included in the empirical analysis process that had an impact in marital fertility changes. For the current study, the author undertook an exploratory review of the temporal changes in the preferred number of children or family size for the married women from the four countries with particular focus on stalling periods. In all the countries, there were decreases in the reported ideal number of children for the married women, but these were limited to periods characterised by significant declines in marital fertility. In Ghana and Kenya, the average ideal number of

children decreased in the first inter-survey period and remained virtually the unchanged for all the subsequent periods. Rwanda and Zimbabwe showed unique trends; the ideal number of children decreased between the RDHS2005 and RDHS2010 only while Zimbabwe experienced decreases for the for four surveys from ZDHS1988 to ZDHS2005/06. The proportions of women desiring 4 or more children represented the majority in all the four countries as at the latest surveys and this may explain why most countries from SSA have experienced stalled fertility transitions at high TFRs.

The proportion of married women who wanted 4 or more children in Ghana increased steadily over the GDHS1988-GDHS2014 period. These changes may have contributed to the indifferent marital fertility transition of Ghana post the initial phase of onset and rapid fertility decrease. Meanwhile, Rwanda experienced notable increases in the proportions of married women who wanted 5 or more children until the RDHS2005 after which there were significant decreases in the last two surveys for 2010 and 2014/15 as more women stated that they wanted 4 or less children. The changes in Kenya involved long-term decreases in the proportions of married women who stated that their ideal number of children was 4, 5 and 6+ while those wanting 3 children increased. It can be observed that in all the four countries, family size preferences were clearly associated with trends in TMFRs. Given that family size preferences are to an extent a reflection of community-level and societal cultural expectations of marital reproduction, it can be argued that the slow evolution of SSA populations with respect to fertility preferences contributed to the slow pace of marital fertility transitions observed in this study. The high demand for children by most women from SSA has been reported in previous research which noted this feature as a prominent characteristic historically (Tabutin et al., 2004).

National-level fertility indicators can mask differences across regions within countries as shown in previous studies (Blacker, 2002; Ezeh et al., 2009; Odwe, 2015). The underlying geographical patterning of the contextual predictors of fertility and the limited capacity for women to determine their fertility outcomes within a country is important especially when provinces/regions have marked differentials in levels of urbanisation. The geographical patterning of fertility determinants has also been previously established in Kenya. According to Odwe (2015), the Western and Coast regions of Kenya showed different trends in the education effects on fertility. In the Coast region, education continued to be a significant determinant of fertility but in the Western region the effect of education on fertility diminished over time (Odwe, 2015).

In the case of Zimbabwe, Ezeh et al. (2009) found that fertility stalling first occurred in some provinces namely Matabeleland North, Masvingo and Midlands between 1999 and 2006. This was before evidence of stalling at the national level was first reported based on the TFR estimates from the 2005-06 and 2010-11 ZDHS surveys. There are factors found in the three provinces that can potentially explain why stalling may have occurred in these provinces before the others. For instance, Matabeleland North is one of the poorest provinces of Zimbabwe with few and sparse health facilities (Mturi and Joshua, 2011). The close association between low socioeconomic status environments and gender inequalities which include diminished power of women to determine their fertility outcomes relative to men, may have contributed to the failure of fertility to decline between 1999 and 2006 in Matabeleland North. It is worth noting that the economic problems of Zimbabwe which reversed the socioeconomic progress since the attainment of independence in 1980 started around the year 1997. In Midlands province,

data from the ZDHS2005/06 show that it was the province with the highest percentage (39%) of women who reported that their husbands wanted more children. Although the linkages between stalling in provincial fertility trends and the highlighted factors have not been directly established empirically, weak family planning infrastructure in the case of Matabeleland North and a high proportion of husbands wanting more children in Midlands were some of the factors that create conditions for provincial disparities in fertility trends.

The issue of fertility trends in SSA especially in the southern region post 1990 has invariably been examined in the context of HIV/AIDS. It has been reported that the emergence of HIV/AIDS had a depressing effect on fertility because of the direct negative effect of HIV on the biological fecundity of the infected women (Camlin et al., 2004; Zaba and Gregson, 1998). The fertility inhibiting effects of HIV/AIDS also operated indirectly through influencing changes in behaviour in the form of reduced coital frequency, and other avenues like increased widowhood and divorce (Terceira et al., 2003; Zaba and Gregson, 1998). The inhibiting effects of HIV/AIDS on fertility were however offset by the adoption of antiretroviral treatment (ART) which enabled HIV-positive women to continue childbearing (Houle et al., 2016). The ability for women to have children enabled by ART may have contributed to stalling in a country like Zimbabwe. This is because prior to ART becoming widely available, about one quarter of the decline in fertility in Zimbabwe for the decade preceding the new millennium was attributable to HIV/AIDS (Terceira et al., 2003).

The decomposition results also showed that coefficients related to male variables particularly education status, unlike females', were positively associated with the increase in the average ASMFR over the observation period. Within the vector of predictor variables used in the

decomposition equation, fertility stalling can be regarded to be more associated with men compared to women. This tendency for men to have greater influence on reproductive indicators has been observed elsewhere (Dodoo, 1995; Ezeh, 1991, 1992; Mbizvo and Adamchak, 1991b; Ngome and Odimegwu, 2014; Odimegwu et al., 2015). It has also been observed in previous research that fertility returns to male characteristics can override female characteristics because of the sociocultural value systems of patriarchy that give more authority to men than women (Duze and Mohammed, 2007).

Looking at the overall picture from the study, one observes that the four countries have had different paths and characteristics of their marital fertility transitions.

7.5. Limitations of the study

While invaluable knowledge may have been obtained from this study, there is need to take the necessary precautions when considering its findings. This is because the research had some limitations emanating from different facets of the empirical steps in data management and analysis as well as the nature of the source of the data. Firstly, one of the limitations of this study relates to an unbalanced set of independent variables. For instance, the lack comparable variables for household SES, religion and abortion especially for the 1980s surveys meant that the study was unable to provide a full appraisal of roles of these factors throughout the period covered by DHS surveys. Secondly, the derivation of community-level variables was based on the administrative boundaries of clusters which may not be synonymous with the patterning of cultural practices. While the use of cluster boundaries to represent communities is technically sound and has been used in other studies, it is always associated with the risk of misclassification of individuals into communities they may otherwise not belong to culturally. Caution is therefore proffered when interpreting the results for community-level variables.

A third limitation of the study emanates from the fact that the sampling criteria of DHS is not necessarily at producing a truly nationally representative sample of married women and men in a country. Consequently, the generalisability of the results from this study calls for precaution. Fourthly, it is also to be noted that the data were treated as pseudo-panel as the DHS surveys are not longitudinal. The inference of causation should therefore be undertaken carefully. A fifth limitation of the study emanates from the quality of reported data from the surveys, for instance, the prevalence of age misreporting by women. This phenomenon, known as age heaping, occurs when respondents tend to report ages ending with digits zero or five despite being inaccurate. This has the effect of distorting the measure of ASMFR. It has however, been found that the quality age reporting in DHS data has been fairly constant over time in many countries (Lyons-Amos and Stones, 2017). Among the countries examined in this study, the exception is Ghana which has had notable downward trend in age heaping and therefore the results from this country ought to be understood with this in mind (Lyons-Amos and Stones, 2017). A sixth limitation of the study regards the slow socioeconomic transformations that have occurred in the four countries studied especially when considering that most inter-survey periods are five years long. There are not large differences between successive surveys' sample distributions to demonstrate the impact of population-level changes on marital fertility rates. However, it is work noting that the focus of the study was not the prove the importance of changes in population characteristics, but the explanatory factors of the marital fertility transitions that have prevailed in Ghana, Kenya, Rwanda and Zimbabwe. Lastly, the data source and available analytical techniques could only allow the number of independent variables that were analysed. As shown in the results from multilevel regressions and decomposition analysis, there were variables that had an effect on marital fertility but were not included in the empirical analyses. Perhaps with more innovation in data manipulation techniques and survey collection by Measure DHS, it will be possible to incorporate new variables that are yet to be discovered in future studies.

CHAPTER 8 : SUMMARY, CONCLUSION AND RECOMMENDATIONS

8.1. Introduction

This chapter comprises three main sections. The first section provides a summary of the study. This involves a summary of each of the seven chapters that have already been presented. The second section is a conclusion to the study. This provides concluding observations from the study with particular focus on the learned knowledge from the analysis in relation to the research questions and objectives. The conclusion also provides a concluding statement in relation to the topic of the study. The last section presents the recommendations borne out of the findings of the study. These recommendations cover academic as well as policy suggestions for the future pertaining to further studies of fertility in SSA and the efforts to adopt effect interventions to reduce the burdens associated with high birth rates.

8.2. Summary of the study

This study set out to investigate the elasticity of fertility in SSA focusing on the temporal changes in the levels of marital fertility rates of four case countries from each of the four sub-regions of the subcontinent. The first chapter articulated the background knowledge on which the study's research problem was predicated. Chapter 1 appreciated the existing knowledge about the determinants of fertility levels and transitions of SSA countries but acknowledged the need to extend the research focus to marital fertility transitions. The second chapter reviewed existing global, regional and national literature on fertility rates and transitions. It explored the arguments from previous scientific studies regarding the determinants of fertility transitions, expanding on the brief overview of the current state of knowledge presented in chapter 1. Chapter 2 highlighted the sociocultural versus economic views pertaining the origins of the European fertility transition. The chapter also discussed the segment of the body of literature comprised of studies that acknowledge the importance of both types of viewpoints in

the history of the European fertility transition as well as that of SSA countries. The review of existing literature for SSA looked at the history of fertility transition on the subcontinent and discussed the previous research findings pertaining to the potential determinants of the temporal changes in the fertility rates of the different countries. Chapter 2 also discussed frameworks providing theoretical underpinning for the study. The chapter discussed the socioeconomic and reproductive behaviour models, their previous applications and their suitability for this research. Chapter 3 discussed the empirical operationalisation of the steps undertaken in the data analysis process to address the research questions. This methodology chapter described the source of the data analysed in the study, the setting of the study, the sample as well as the variables incorporated in the analytical framework.

Chapter 4 presented the distribution of the study sample focusing on the temporal shifts in the composition of the populations of Ghana, Kenya, Rwanda and Zimbabwe. The use of the term populations is predicated on that the sampling weights were used throughout the analysis thus making it possible to speak of the sample distribution as reflective of the national populations. Chapter 4 also presented the trends of TMFR transitions of the four countries, showing that all the countries have experienced decreases in the levels of marital fertility. The same chapter also provided evidence of the statistical significance of the phases of the marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe, showing that once started, the declines of marital fertility have not been characterised by continuous trajectories towards replacement level rates. Chapter 5 presented results from the multilevel modelling of the mean ASMFRs for 23 DHS datasets. The results reported in chapter 5 showed the cross-sectional marital fertility differentials that can be explained by proximate determinants, female, male as well as other background factors. Chapter 6 presented the results from the decomposition analysis. These were reported as aggregate results in the first sections of the chapter with the detailed

findings being presented according to the classes of the independent variables. The classes of the independent variables were proximate, female background, male, demographic and socio geographic. Chapter 7 discussed the research results in the light of reviewed scientific literature. The discussion first looked at the evidence of marital fertility transition observed in this study. This was followed by a look at the findings from multilevel analysis, highlighting points of convergence and divergence with existing literature. In instances of divergence, the discussion provided explanations why these were observed. The discussion of the decomposition results was provided after that for multilevel results. In the current chapter subsequent to the above, conclusions and recommendations are provided below.

8.3. Contributions of the study to fertility literature

The overarching goal of this study was to investigate the sources of changes in the marital fertility rates of Ghana, Kenya, Rwanda and Zimbabwe. To achieve this goal, the study undertook analyses of the trends, cross-sectional differentials and the sources of temporal decreases/increases of marital fertility rates in the four countries. In doing so, this study made notable contributions to the existing body of fertility research in SSA. One of these contributions is the use of an age-adjusted measure of fertility which is consistent with the main indicator of fertility transition. Many studies of fertility have analysed the CEB to draw conclusions about determinants of fertility transition. This thesis was able to demonstrate that an age-adjusted indicator of fertility like ASMFR is a better measure when analysing changes in fertility rates because CEB cannot be relied on to capture stalls. A good example of this was the stall of TMFR transition between the ZDHS2005/06 and ZDHS2010/11 where unlike CEB, ASMFRs were able to capture it.

The positive relationship between the use of modern contraceptives and marital fertility was a novel finding. However, it important implications on the age distribution of marital fertility and contraception use among women in unions in the four countries studied. Looking at the age profile of ASMFRs, one observes that most of the childbearing for women in unions occur in the 20-29 age group. This same age group also has the highest contraceptive prevalence rate. The majority of non-users of modern contraceptives are women who have already achieved their family size goals, are aged above 35 years. The positive relationship is because childbearing is nearly universal among married women.

8.4. Conclusion to the study

The results obtained from the analysis of the data enabled several observations which warrant a few conclusions the be made in relation to each of the research questions and the overall research. The estimation of TMFRs and reconstruction of annual trends showed that all the four countries have experienced decreases in marital fertility levels albeit to varying degrees. The marital fertility transition of Zimbabwe started before those of Ghana, Kenya and Rwanda but over time the marital fertility rates of the four countries showed evidence of convergence. Despite the convergence of marital fertility rates, the results of the underlying age distributions of ASMFRs revealed that these varied across the four countries. To conclude on the first research question, the results from Chapter 5 warrant the conclusion that the marital fertility rates of Ghana, Kenya, Rwanda and Zimbabwe have indeed fallen over the past three decades. In this regard, the study generated indisputable proof that the four countries are mid-way through the transition towards low marital fertility.

The analysis of the temporal behaviour of TMFR trends showed that the marital fertility transitions were characterised by differences in the timing of the episodes of rapid falls, stalls and slow declines. Ghana, Kenya and Rwanda have had three distinct periods in their histories of TMFR transitions while Zimbabwe has had four. This may have been due to Zimbabwe experiencing greater access to mass education earlier than in the other three countries. Besides the differences in the nature of the progress of the transitions, the timing of the onset of marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe also differed. With regards to the second research question, it is therefore concluded that the timing and progress of the marital fertility transitions of the four countries were not the same. The properties of each country's transition were unique. The evidence generated from the study thus warrants the assertion that to a great extent, the temporal behaviour of marital fertility change varies across countries.

Multivariate random effects linear regression models were explored to address the third research question. The multilevel parameters of the 23 models showed that taking into account the hierarchical nature of DHS data in the analysis of marital fertility improved the understanding of cross-sectional variabilities in fertility rates. The fixed effects estimated from the regression models showed that associations between the mean rates of ASMFRs and the independent variables changed over time in all the four countries. In some surveys, there were statistically significant positive effects of the proximate and background variables while the opposite prevailed in other surveys. This was also true for statistically insignificant results whereby the tendency for positive associations were observed in some surveys and negative relationships were found in others. Based on the results presented in Chapter 4, it can therefore be concluded with respect to the third research question that the nature and magnitudes of differentials in marital fertility rates due to proximate and background determinants changed over time for each country.

The interrogation of the data using the threefold Oaxaca-Blinder decomposition technique to address the fourth and fifth research questions yielded interesting results. The study found that in all the four countries, the driving force of the proximate determinants especially contraception and postpartum infecundity was reflected in the actual inter-survey decreases in marital fertility although there were instances when this was not the case. The background factors like community-level of male education status and desire for more children appeared to be more associated with stalls in marital fertility transitions than proximate determinants.

With regards to compositional versus coefficients effects, the study found that the temporal changes in the distributions of the samples exerted more effective pressure on the levels of fertility than changes in coefficients. The inter-survey decreases and increases of marital fertility rates were thus mostly due to the endowments effect compared to coefficients effect. The conditional percentage contributions of coefficients thus highlighted a window of opportunity that can be exploited by relevant policy interventions to achieve faster marital fertility transitions. The male variables were as important as female characteristics in affecting marital fertility transitions especially for the inter-survey periods characterised by significant decreases in fertility rates.

In some countries like Kenya and Rwanda, the observed temporal marital fertility changes were more in sync with driving force of male variables than with the comparable female variables. In Ghana and Zimbabwe, male variables were more associated with stalls and reversals of the marital fertility transitions. Looking at the full set of the variables, the major drivers of the marital fertility transitions of Ghana, Kenya, Rwanda and Zimbabwe contraception,

postpartum infecundity, male occupation individual-level education of both females and males, and the desire for children. The other factors were also important, but their roles were not as big as those highlighted.

8.5. Recommendations and frontiers for further research

The findings from this study warrant several academic and policy recommendations. These are laid out below starting with recommendations for future frontiers for further research. The results from multivariate decomposition analysis and to some extent multilevel regressions showed that the understanding of marital fertility rates and their temporal changes can be fully understood by employing two-sex modelling. In patriarchal societies like those mostly found in SSA, demographic problems emanate from the social structures which are characterised by unequal division of power and decision-making which are associated with the ability to determine other people's individual outcomes. It is therefore recommended that demographic research does not dissociate its objects of study like fertility, mortality, diseases among others from the social structures within which they are nested. The incorporation of variables that are reflective of the wider societal social organisation in future studies of fertility through use of innovative analytical methods is recommended. Linked to this is that demographic research continues to develop ways of leveraging analytical techniques developed in other disciplines for application in the study of demographic events without compromising the continuous refinements of demographic methods specific to demography. Furthermore, some variables which were not included in this study provide avenues for further research in the field of marital fertility. For instance, pooled couple characteristics can be analysed to generate more nuanced insight on marital fertility in analyses that do not also include separate characteristics for males and females to control for multicollinearity.

This study found evidence to suggest the men's desire for more children can have important implications on the fertility rates of women. The academic recommendation borne out of this finding is that it will be beneficial to body of fertility knowledge to investigate the parity thresholds at which husbands begin to prefer less children. It will be important for policy as well as for enhancing the stock of knowledge pertaining demographic change to understand how men's desires for more children are associated with the parity levels of their wives as well as the parities of men when including out-of-wedlock children. The other recommendation pertains the growing prevalence of the Pentecostal/Evangelical Christian Orthodox churches, widely known as charismatic churches, which need to be investigated in relation to fertility transition. This is because religion/spirituality especially that of the charismatic churches has become very integral to the lives of many people residing in SSA especially the Anglo West and Southern subregions. The extent to which these have impacted on the pace of fertility transition can be vital for policies and general understanding of the social transformations affecting demographic change. The traditional African belief systems which inculcated high religiosity through demonstrable miracles were associated with high fertility rates. The growing prevalence of Protestant churches with their lack of demonstrable miracles arguably created the social conditions for the onset of fertility transition although the extent to which this was true has yet to be systematically investigated. The emergence of charismatic churches which like traditional belief systems are characterised by miracles and relatively high religiosity, may potentially present a hurdle to the prospects of faster fertility transition although this line of inquiry has not been undertaken. It is therefore recommended that investigating the fertility transition implications of the rise of charismatic churches can be a interesting avenue for understanding demographic change in SSA.

The results from this study have different policy implications which warrant a several recommendations. It was evident from the results that the husbands of the enumerated women were associated with exerting considerable impact on the fertility outcomes of their wives. The ability of men to influence the fertility outcomes of women in the SSA context is informed by patriarchal value systems which apportion greater power to men than women. To overcome this state of disequilibrium, there is need for governments to play active roles in redefining the pillars of patriarchy from being pro-natal to being supportive of low fertility.

Linked to the above are the opportunities for realising sustainable low fertility rates presented by the large conditional percentage contributions of coefficients. The disjuncture between the observed fertility changes and what would have prevailed as reflected in the coefficients' conditional percentages highlight policy gaps that need addressing. Policy interventions should therefore be targeted at sustaining the downward shifts in the desires for few children. Such policies are crucial in countries like Zimbabwe where stalling has occurred within a context of increased prevalence of use of modern contraceptives among married women.

The study found the growing prevalence of charismatic Pentecostal churches across the countries. These churches can be used as vehicles to influence desirable demographic changes in SSA countries by cultivating their support on the efforts to hasten fertility transition. This can be vital in countries like Ghana and Zimbabwe where some large conditional contributions of coefficients for religion were observed. The multilevel models showed that marital fertility rates differed by geographic location such as rural-urban and cluster level. While the differences in the rural-urban contexts may have been considered in the formulation of previous

fertility management policies, the smaller levels of geographical differences need to be incorporated in future interventions.

The educational attainment indicators particularly for Ghana and Rwanda and to an extent Kenya showed that a small proportion of the married women had secondary and post-secondary education. Zimbabwe showed relatively higher levels of secondary education for women and men but there are still low levels of tertiary education attainment. The need to ensure access to secondary and post-secondary education should therefore be given urgent priority across all the countries. The urgent address of developing education infrastructure needs to be complemented with creation of conducive economic environments that are supportive of job creation. This is because the fertility inhibiting effects of education appeared to be countered by lack of enough participation in skilled professions in most cases meaning that most women were in unskilled and agriculture jobs which associated with high marital fertility rates. The framing of the development agenda must be adapted as a fertility management framework as opposed to regarding fertility control as a pre-requisite for development.

This study found evidence suggesting the importance of postpartum infecundity in marital fertility differentials an in some cases temporal changes. These findings have also been observed in other studies like Finlay et al. (2018) and Haile and Mekonnen (2018). The results on the importance of this traditional method of fertility management have policy implications that cannot be ignored especially considering that many countries from SSA have been experiencing slow economic development. It is therefore recommended that policies pay attention to the potential of postpartum infecundity in influencing fertility decline particularly in resource-poor areas where there is little coverage of modern contraceptives. This can be an

effective short-term policy intervention that creates time for designing the long-term strategies to increase the reach of promotion of modern contraceptives.

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APPENDIX A: LITERATURE REVIEW MATRIX

#	Authors	Title	Data	Main methods	Level of analysis	Findings	Gaps
1	Agadjanian V and Yabiku ST 2014	Religious Affiliation and Fertility in a Sub-Saharan Context: Dynamic and Lifetime Perspectives	Survey data from Chibuto district, southern Mozambique	Event-histrory analysis and Poisson regression	Individual level using individual-level predictors	Significant increase in fertility associated with membership in a particular type of African-initiated churches which is characterized by strong organizational identity, rigid hierarchy, and insular corporate culture. Membership in the Catholic Church is also associated with elevated completed fertility.	Investigated individual-level determinants
2	Ahene-Codjoe AA 2007	The Effects of Education on Fertility Change in Ghana: A Decomposition Analysis	Ghana Living Standards Survey GLSS 1 and 4 of 1987/88 and 1998/1999	Oaxaca decomposition	Individual level, using household and community-level predictors	The decline in fertility albeit small is mainly attributed to differences in characteristics and the most important of these is expenditure.	Analysed community variables in terms of distance from household, and did not capture usage of the community infrastructures [clinic, market, maize, child wage, adult wage,household head characteristics]
3	Ainsworth M, Beegle K and Nyamete A 1996	The impact of women's schooling on fertility and contraceptive use: A study of fourteen sub-Saharan African countries	Demographic and Health Surveys [selected sub-Saharan African SSA countries			Controlling for background variables, the last years of female primary schooling had a negative relation with fertility in about half the countries, while secondary schooling is associated with substantially lower fertility in all countries. Among ever-married women, husband's schooling exerts a smaller effect than does female schooling on contraceptive use and, in almost all cases, on fertility.	Pre-1990 data
4	Bongaarts J 2008	Fertility transitions in developing countries: Progress or stagnation?	DHS	Trend analysis	Individual level	The pace of fertility decline in SSA countries declined during the 2000s with half of the countries I ntransition having experienced stalling.	Did not investigate the community-level determinants of the observed trends.
5	Bongaarts J and Casterline J 2013	Fertility Transition: Is sub-Saharan Africa Different?	DHS and WFS	Descriptive and trend analysis	individual level	Reproductive behaviours of African populations differ from those of other continents namely Asia and South America.	

6	Bongaarts, J., 2015.	Modelling the fertility impact of the proximate determinants: Time for a tune-up	DHS	Calculations of the indices of proximate determinants		The PD model remains conceptually sound. The adjustments make the PD model a better fit for understanding fertility	The aim of the study provides knowledge to build on for the current study. It was not designed to address the question of drivers of marital fertility transtion
7	Bongaarts, J., 2017.	The effect of contraception on fertility: Is sub-Saharan Africa different?	DHS	OLS regression	Country level	Increasing contraceptive prevalence has a significant depressing effect on TFRs	Study was focused on CPR and TFRs and was not designed to investigate drivers of marital fertility transition
8	Bundervoet T 2014	What Explains Rwanda's Drop in Fertility between 2005 and 2010?	DHS	Decomposition	Individual level	Improved female education levels account for the largest part of the fertility decline, with improving household living standards and the progressive move toward non-agricultural employment being important secondary drivers. The drop in fertility has been particularly salient for the younger cohorts, for whom the fertility decline can be fully explained by changes in underlying determinants, most notably the large increase in educational attainment between 2005 and 2010	Did not control for some of the important individual variables such as marital status, contraceptive use and age at marriage. Furthermore, focused on a fifve-year period which is too short to explain fertility transition outcomes over three deacdes.
9	Burger RP, Burger R and Rossouw L 2012	The fertility transition in South Africa: A retrospective panel data analysis	South Africa National Income Dynamics Study	Ordinary Logistic Regression	Individual level	The analysis attributes a large share of the observed fertility decline across birth cohorts to improving education levels and the lower prevalence of marriage. However, a considerable segment of the transition is ascribed to the unobservables.	The unobservables to which some of the fertility decline are attributed are not known from the study. Alludes to he role of indirect factors but did not investigate what some of these could be and estimate their roles.
10	Caldwell JC 1977	The economic rationality of high fertility: An investigation illustrated with Nigerian survey data	Changing African Family Project, Nigeria Segment	Descriptive analysis	District level	Fertility likely to decline due to changes in the economic calculus as the old social system crumbles. Economic rationality explanations unsuitable to explaining fertility regimes of African populations.	Didi not quantify the effects of the components of the social system on fertility levels.

11	Casterline JB 1987	The collection and analysis of community data	WFS	Review of literatures	…	The design of WFS community survey was not very effective but findings from the data provided useful pointers on community-level determinants of fertility.	Paper provided pointers based on reviewed literatures on how to analyse community-level determinants. It was outside the scope of the paper to estimate the contributions of community-level factors to fertility changes
12	Chimbwete C, Watkins SC and Zulu EM 2005	The evolution of population policies in Kenya and Malawi	Written accounts and interviews with international actors and policy development players from Kenya and Malawi	…	Thematic analysis	During the post-war period global actors such as the Population Council, United Nations and the World Bank urged third-world governments to adopt neo-Malthusian population and family planning policies in order to contain population growth.	The paper explored the evolution of family planning policy and not fertility although family planning is an important determinant of fertility change.
13	Cleland J, Onuoha N and Timaeus I 1994	Fertility change in sub-Saharan Africa: a review of the evidence.	DHS and WFS	Cohort parity progression ratios	Individual level	Several African countries have experienced considerable fertility decline while others have experianced modest declines.	Study was largely descriptive and did not investigate community-level deteminants of fertility change.
14	Cohen B 1998	The emerging fertility transition in sub-Saharan Africa	Existing literatures	Review of existing evidence	…	The driving forces fertility decline are later marriage and the greater use of modern contraception. A unique characteristic of African transitions appears to be the extent to which contraceptives are being used to space rather than to limit births.	The paper did not set to investigate community-level determinants.
15	Dodoo FN-A 1998	Men matter: Additive and interactive gendered preferences and reproductive behavior in kenya	Kenya DHS	Logistic regression	individual level	Additive and interactive measures of preferences showed a significant effect of men's preferences, which may eclipse womne's preferences	The paper focused on fertility preferences and contraceptive between men and women
16	Dodoo FN-A, Luo Y and Panayotova E 1997	Do male reproductive preferences really point to a need to refocus fertility policy?	Independently collected survey data in fourteen localities in Accra	Descriptive analysis	Individual level	Findings corroborate the earlier studies and suggest that fertility transition in Africa may be accelerated if the family planning establishment would recognize the contribution of the ‘male role’, and	Small sample size, and descriptive only. No estimation of associated determinants.

						bring men into the mainstream of their agenda.	
17	Dribe, M., Hacker, J.D., Scalone, F., 2014a.	Socioeconomic status and fertility before, during, and after the demographic transition: An introduction	Existing literatures	Review of past studies		The relationship between socioeconomic status and fertility rates not universal across the studies	A review of past studies does not address the questions that have been raised in relation to the existing body of literature.
18	Dribe, M., Oris, M., Pozzi, L., 2014b.	Socioeconomic status and fertility decline: Insights from historical transitions in Europe and North America	Micro-level census data North America and Europe			Socioeconomic status - midlled and upper class led the fertility transition	Based in the developed world that and focused on fertility in general as well as exclusion of male variables
19	Duze MC and Mohammed IZ 2007	Male Knowledge, Attitude, and Family Planning Practices in Northern Nigeria	Survey data purposively collected by the authors	Path-analytic decomposition	Individual level	High knowledge of contraceptives, negative attitude towards limiting family size for economic reasons, and consequently low rates of contraceptive use. Respondents who were willing to use contraceptives were more willing to use them for child spacing and not limiting family size. Path-analytic decompositions of the effects of predictor variables show that education has the largest direct and total effects on contraceptive use while specific knowledge of contraceptives has the smallest direct and total effect. Most importantly, attitudes have the largest direct effect on contraceptive use.	Used individual-level predictors
20	Ekane, D., 2013.	Fertility trends in sub Saharan Africa	Existing literatures	Review of literatures		Social organisation and cultural setting play a pivotal role in driving high fertility rates in SSA	The paper perpetuates existing gaps because it does not add new evidence-based knowledge about fertility determinants.

21	Ezeh AC 1993	The Influence of Spouses over each Other's Contraceptive Attitudes in Ghana	Ghana DHS and Focus Group Discussion FGD	Logit model	Individual level	Spousal influence, rather than being mutual or reciprocal, is an exclusive right exercised only by the husband.	The study was primarily focused on reproductive behaviour and not fertility outcomes *per se*
22	Ezeh AC and Dodoo FN-A 2001	Institutional change and the African fertility transition: the case of Kenya	DHS and WFS	Standardisation and decomposition techniques	Community level	Institutional changes had a negative net effect on fertility change	Did not control for other variables at household and individual levels, hence findings and conclusions are susceptible to ecological fallacy.
23	Ezeh AC, Mberu BU and Emina JO 2009	Stall in fertility decline in East African countries: regional analysis of patterns, determinants and implications	DHS	Multivariate probit regression	Individual level	Found strong selectivity of fertility stall across different groups and regions in all four countries. Declines in contraceptive use, increases in unmet need for family planning, increasing preferences for larger families, and increases in adolescent fertility were consistently associated with stalls in subgroup fertility across all four countries.	Variables such as child fosterage, domestic violence and health facility usage were not included in the variables investigated.
24	Ezeh, A.C., Dodoo, F.N.-A., 2001.	Institutional change and the African fertility transition: the case of Kenya	DHS and WFS	Standardisation and decomposition techniques		Changes in marriage rates and educational attainment of women vital in the decline of TFRs in the 1980s	The exclusion of male component, and the lack of focused examination of marital fertility. The study was conducted before the emergence of stalling, and so did not benefit from the opportunity to examine this phenomenon to obtain a rounded understanding of the temporal relationships with fertility of independent variables
25	Finlay, J.E., Mejía-Guevara, I., Akachi, Y., 2016.	Delayed marriage, contraceptive use, and breastfeeding: Fertility patterns over time and wealth quintiles	DHS	Proximate determinants indices		Breastfeeding declining and pushing fertility up. Contraceptive use increasing among the richest wealth quantiles thereby reducing the fertility rates of this segment.	The focus on proximate determinants indirectly underestimates the role of background factors especially when one wants to understand marital fertility.

		in sub-Saharan Africa					
26	Garenne M 2008	Situations of fertility stall in sub-Saharan Africa	DHS	Trend analysis and standardisation	Country level	Fertility stalls were often associated with changes in two proximate determinants contraceptive use and age at marriage and in two socio-economic correlates income and labour force participation.	Examined different community-level determinants.
27	Goujon A, Lutz W and KC S 2015	Education stalls and subsequent stalls in African fertility: A descriptive overview	United Nations data and data from Wittgenstein Centre	Descriptive trend analysis	Country level	In most sub-Saharan African countries, we observe that the same countries that had fertility stalls had a stall in the progress of education, particularly for young women who were of primary school age during the 1980s, when most of the countries were under structural adjustment. Conversely, stalls in fertility are less common in countries that did not have an education stall, possibly in relation to SAPs.	Only focused on education, other community-level determinants were not examined.
28	Kravdal Ø 2012	Further evidence of community education effects on fertility in sub-Saharan Africa	DHS	Time-discrete hazard models	Individual level using community-level education as the predictor	Negative associations between a woman's birth rate and the average education in the census enumeration area in which she lives, net of her own education, have remained stable or become stronger over the last decade. These associations are most pronounced among women who score high on indicators of socioeconomic development which suggests that they may become further strengthened.	Only focused on education.

29	Mberu BU and Reed HE 2014	Understanding Subgroup Fertility Differentials in Nigeria	Nigeria DHS	Multiple linear regression	Group level	Many population subgroups and zones of the country are finally beginning to show signs of fertility convergence and decline. Nevertheless, some population subgroups still have higher fertility, especially: Hausa/Fulani/Kanuri women, women who live in the North West geopolitical zone, Muslim and traditionalist women, women who live in poor households, women who have lower levels of education, women who are opposed to family planning, women who marry early, and women who give birth early.	Nigeria's high fertility makes it difficult to estimate, quantify and predict the effects of the identified variables to fertility decline especially in the countries that have experienced fertility transition over the past half century
30	Odimegwu C and Adedini S 2014	Gender equity and fertility intention in selected sub-Saharan African countries	DHS; Kenya and Nigeria	Multivariate logistic regression	Individual level	Significant negative relationship between educational attainment and fertility level. Fertility level also negatively associated with wealth status	Community-level determinants were outside the scope of the paper
31	Odimegwu C, Bamiwuye OS and Adedini SA 2015	Gender-based violence as a new proximate determinant of fertility in sub-Saharan Africa	DHS	t-test and Poisson regression	Individual level	Fertility is higher among women who had experienced domestic violence than those who did not. Results from Poisson regression showed that higher fertility is associated with experience of any form of violence in two of the three selected countries, even after controlling for background variables	Didi not investigate the contributions of community-level variables.
32	Rutayisire PC, Hooimeijer P, Broekhuis A, et al. 2014	Changes in Fertility Decline in Rwanda: A Decomposition Analysis, Changes in Fertility Decline in Rwanda: A Decomposition Analysis	DHS	Decomposition	Country level	Due to widowhood and separation, the proportion of women who were married decreased between 1992 and 2000, but their fertility increased in the same period due to replacement fertility and an unmet need for family planning. After 2000, postponement of marriage and lower infant mortality contributed to lower fertility, but the most important effect was the overall lower fertility due to improved family planning provision.	Community-level variables such as child fosterage, type of health facility and exposure to domestic violence were excluded from the study.

33	Schoumaker B 2009	Stalls in fertility transitions in sub-Saharan Africa: Real or spurious?	DHS	Trend analysis and longitudinal regressions	Country level	Several countries in SSA have experienced fartility stalling. Data quality issues may have led to erroneous estimates of fertility levels, rendering stalling observations spurious. Changes in proximate factors not related to fertility trends in some of the countries that have stalled fertility.	Didi not estimat the effects of sample composition for each country to observed changes in fertility levels.
34	Shapiro D and Gebreselassie T 2013	Fertility transition in sub-Saharan Africa: falling and stalling	DHS	Seemingly unrelated regressions SUR	Individual level	Among the two dozen countries covered by multiple surveys, 22 have initiated fertility transition, and a third of these countries have experienced stalling of fertility decline. Education, infant and child mortality, modern contraceptive use, the percentage of women in union, place of residence, and time all are significantly related to fertility levels.	Focused on individual-level determinants. Community-level predictors were exlcuded from the analysis.
35	Shapiro D and Tenike M 2015	Women's Education, Infant and Child Mortality, and Fertility Decline in Sub-Saharan Africa: A Quantitative Assessment	DHS	Decomposition analysis	Individual level	Changes in women education and under-five mortality responsible for more than 45% change in fertility levels.	Investigated the effects of women education and under-five mortality. Male correlatse and other community determinants were not examined.

APENDIX B: POLICY BRIEFS

POLICY BRIEF FOR GHANA

Introduction

The education and employment characteristics of a population as well as its contraceptive use patterns are inextricably linked to the demographic conditions of human populations. These three factors have been found to play a crucial role in fertility transition across sub-Saharan Africa (SSA). This policy brief looks at how the three factors have been associated with the trends of total marital fertility rates (TMFRs) and total fertility rates (TFRs) of Ghana based on the data from the Demographic and Health Surveys (DHS) from 1988 to 2014. The aim is to highlight areas of great potential and policy gaps that can be exploited to affect a faster decline of marital fertility thereby enabling the country to curb the high population growth rates.

Context

Ghana was the first country from SSA to attain independence from colonial rule in 1957 and was the third nation to introduce a population policy in 1964 to manage its demographic transition. However, the goals of the population policy remained elusive with TFRs failing to decrease until the late 1980s. An updated policy was adopted in 1994 but the gains in the fertility transition of Ghana have been less than impressive. The current demographic situation for Ghana is characterised by stalled marital fertility transition at high levels of TMFRs and high annual population growth rate. According to the Ghana Statistical Office (2019), that total population of the country is approaching 30 million having been 24.6 million in 2010, implying a high annual growth rate of more than 2.5%. The TMFR estimate for Ghana as of the 2014 DHS survey stood at 6.3 while the TFR was 4.2.

Specific findings

The late 1980s and early 1990s witnessed rapid declines in TMFRs and TFRs which was characteristic of the onset of fertility transition in Ghana [Figure G1]. The post 2000 period saw TFRs decreasing at a slower pace while TMFRs showed a generally rising trend. This means that the stalled fertility transition of Ghana was in fact a stall in the decline of marital fertility. The use of modern contraceptives remained stubbornly very low over the 1988-2014

period, taking 26 years to rise from 8 to 22%. Despite decreasing over time, the majority of the women (over 70%) were non-users of modern contraceptives. Such low uptake of birth control methods is characteristic of a society whose pronatal patriarchal sociocultural sphere poses a strong barrier to curbing high population growth.

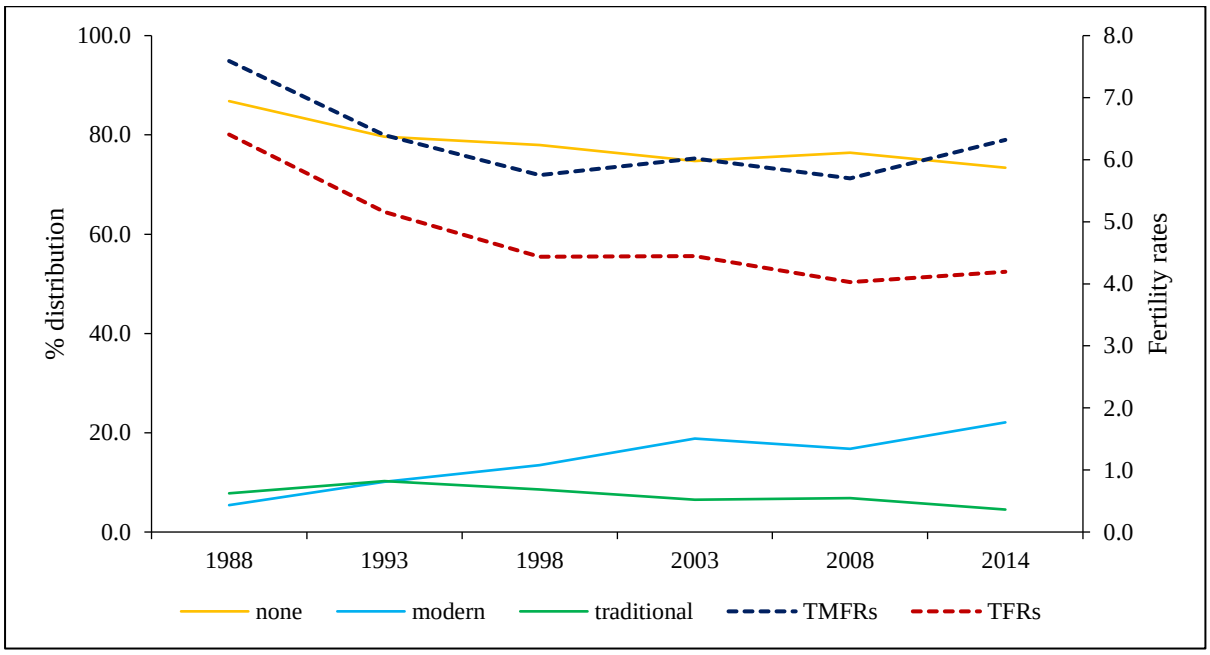

Figure G1: Trends in the levels of contraceptive use and fertility rates

In the Figure G2 below, trends in the distributions of married males and females by education and occupation characteristics with superimposed trends in the TMFR and TFR rates. there was a significant rise in the educational attainment of both males and females especially between the 1993 and 1998 GDHS surveys as proportions with secondary education rose sharply. There were however no further gains in educational attainment post 2000. The growth in proportion with secondary education stalled for males while for females there were limited increases between the 1998 and 2014. As of the 2014 GDHS survey, only 5 and 12% of females and males had tertiary education.

Given the generally subdued growth in the coverage of secondary and tertiary education, the employment characteristics of the Ghana sample did not improve notably for most of the post-2000 period. The majority of the women have historically been employed in either semiskilled of agriculture jobs. There is evidence of inequality in employment between men and women

which carry from education inequalities where greater attainment was observed for men compared to women. The rapid decline in fertility rates for the late 1980s and early 1990s period mirrored the sharp decrease in the proportion of married women who were not employed as involvement in agriculture jobs increased. However, there were limited improvements in the employment composition of the sample of married women and men although the latter have had greater access to skilled jobs.

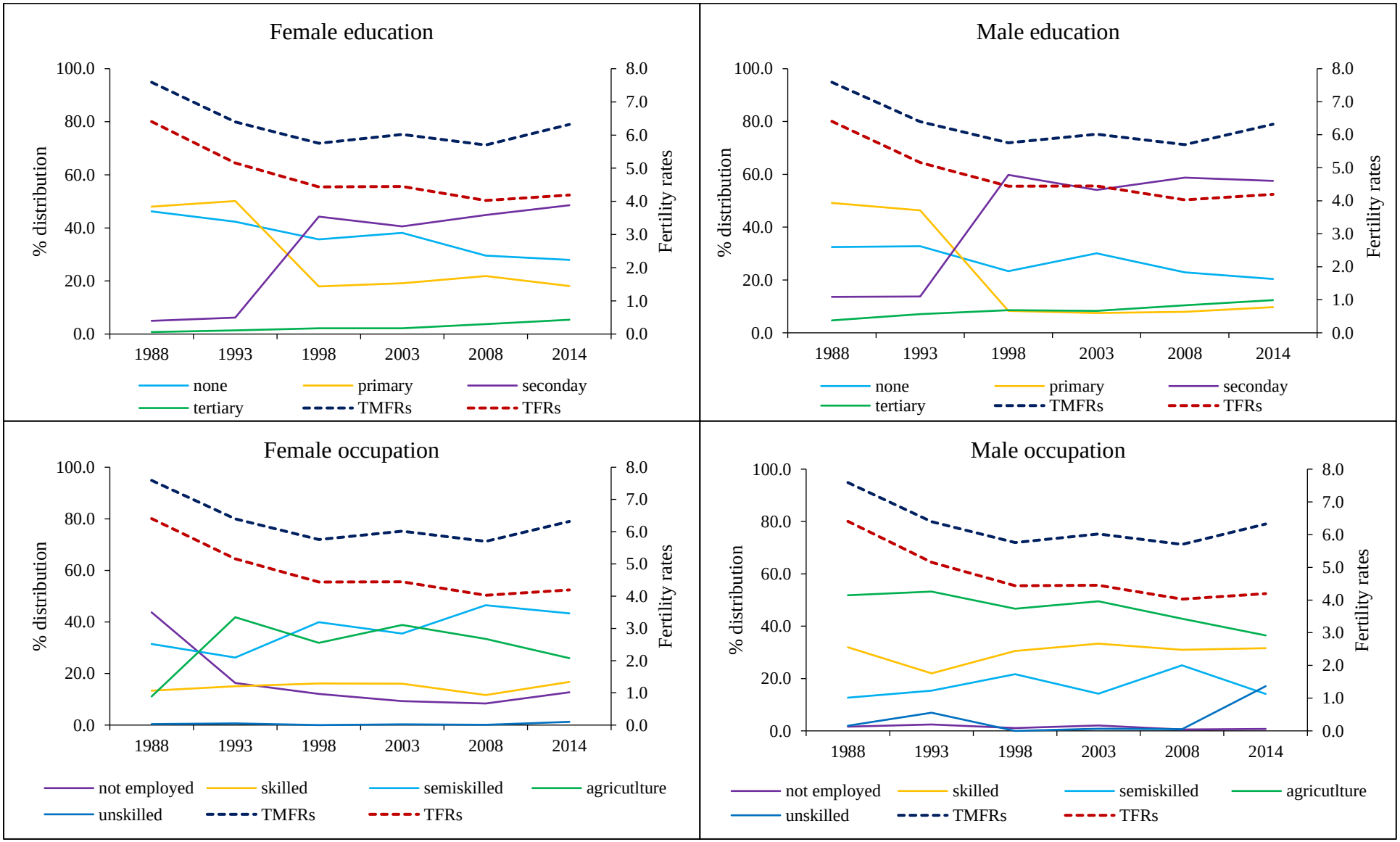

Figure G2: Temporal distributional changes in the male and female education and occupation characteristics and fertility rates

The temporal changes in the education and employment characteristics of the married sample and the associated trends in TMFRs and TFRs highlight important policy implications that can be exploited to unlock the barriers to a faster fertility transition and effective curbing of high population growth in Ghana.

Policy recommendations

What is clear from the results is that Ghana needs to urgently raise the coverage of secondary and tertiary education in the country. The stalling of especially marital fertility transition mirrored that of growth in educational attainment. To return to the pre-1998 fast declines of fertility rates, Ghana needs to attain at least 70 and 20% coverage of secondary and tertiary education respectively for its population for both men and women. Increasing educational attainment will potentially make it easier to transform the contraceptive use practices of the married population given how low these have been over the years.

Together with increasing educational attainment, a concerted effort is urgently needed to reduce the widening gap between TMFRs and TFRs through a rigorous campaign to increase the adoption of modern contraceptive methods. In this regard, a thorough search to determine the spatial variability of the determinants of modern contraceptive use should be conducted. This will enable the government to adapt its population policy accordingly when implementing interventions to overcome the resistance to modern methods of contraception. The country can leverage on the location of its clinics and district hospitals to collect data and map the barriers to contraceptive use. This will enable the government to distinguish sociocultural from structural barriers thereby enabling a more effective adaptation of the population policy.

POLICY BRIEF FOR ZIMBABWE

Introduction

This study investigated the trends in the total marital fertility rates (TMFRs) of Zimbabwe using Demographic and Health Survey (DHS) data from 1988 to 2015. The purpose of this policy brief is to communicate urgent policy implications of the findings from the study taking into consideration the current macro situation of the country.

Context

The total population of Zimbabwe is currently estimated to be 16.9 million with an annual growth rate of 2.3% and total fertility rate (TFR) of 3.7 birth per woman (United Nations Department of Economic and Social Affairs, Population Division, 2019). The demographic transition is currently underway in the country and has profound implications for the country's economic development and future prospects for a demographic dividend. Evidence of fertility transition in the country is well established including the occurrence of stalling at high levels of TFRs. The largest contribution to the high TFRs that have prevailed in Zimbabwe has been marital fertility. The stalling of the transition in TFRs was actually a stall in the decline of TMFRs.

Specific findings

The findings from this study showed limited progress in the decrease of the proportions of husbands desiring less children and educational attainment beyond secondary level. Due to the limited tertiary educational attainment, the participation rates in skilled professions have been low in Zimbabwe. The Figures below show how the trends in educational levels, occupational distribution and fertility desires and how these relate to the TMFR and TFR transitions. As shown in the Figures, the stalls in the growth of educational attainment were associated with either the slowing down of stalling of marital fertility transition. This therefore calls for policy interventions aimed at maximising on the current high rates of secondary education attainment to expand tertiary education participation and attainment rates. There has been limited growth in the proportion of the married population involved in skilled professions with more than 50% of the men and women found non-skilled jobs.

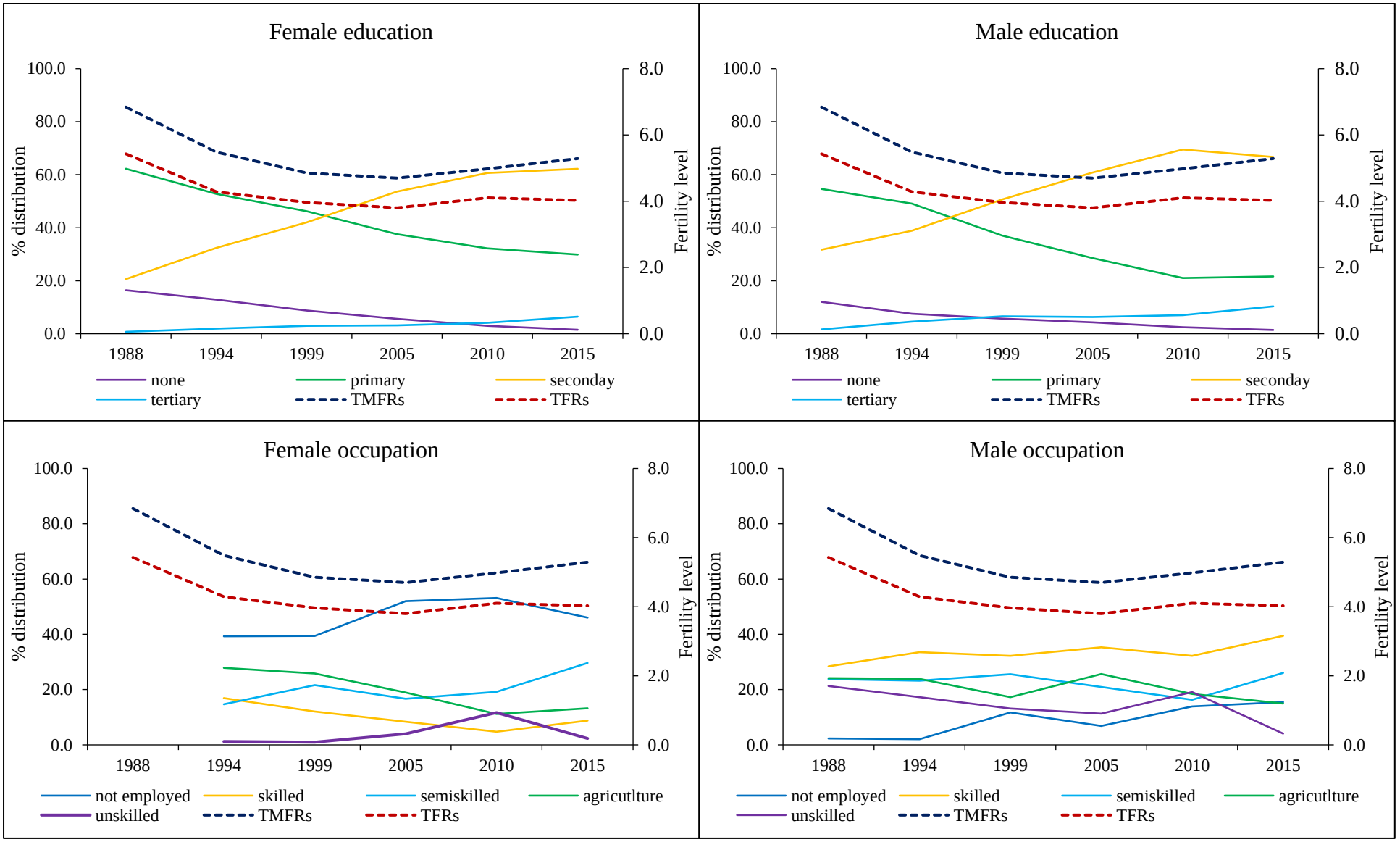

Figure Z1: Trends in the education and occupation distributions of men and women in unions and fertility rates in Zimbabwe, DHS surveys

The Figure Z2 shows that as of the ZDHS2015, about half of the married sample did not agree on their fertility desires. While there has been notable growth in proportions sharing the same desires for number of children between 1994 and 2010, there was a sharp decrease between 2010 and 2015.

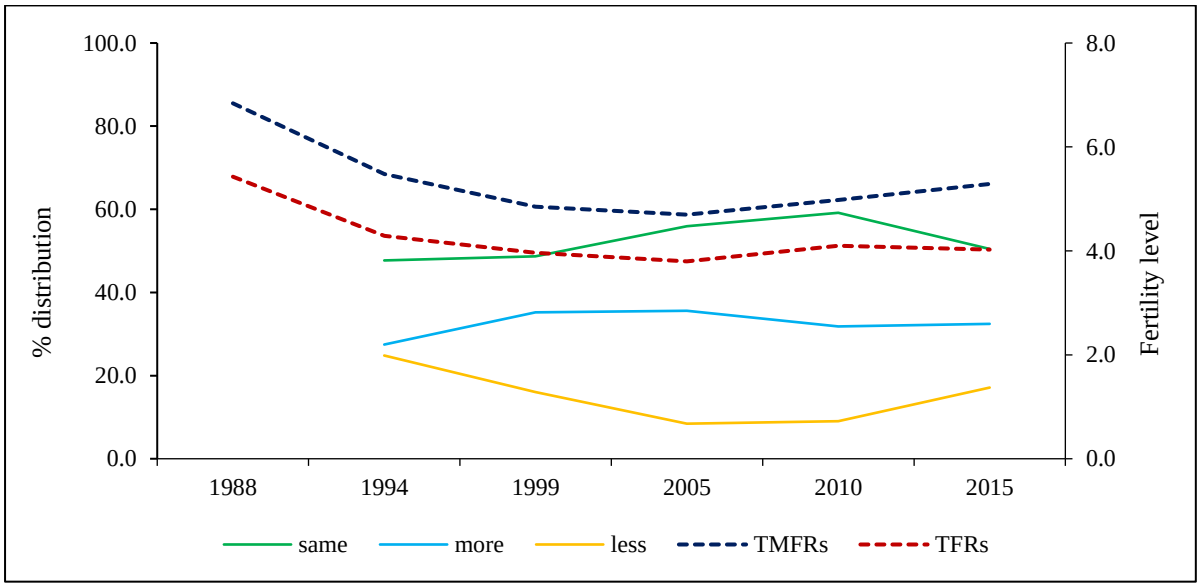

Figure Z2: Temporal changes in the distribution of women by husband's desire for children in relation to fertility rates.

It has been shown in other previous scientific studies that lack of agreement on fertility goals can result in inconsistent use of contraceptives (Dodoo, 1998). In the event of husbands desiring more children, it can be a highlight of gender inequalities between partners which often result in higher fertility rates (Odimegwu et al., 2015). The results reported in Figures Z1 and Z2 call for urgent policy attention to enhance the demographic transition of Zimbabwe and place the country in a better platform to realise a demographic dividend in the future.

Policy recommendations

The demographic transition of a country currently experiencing high fertility rates requires innovative policy interventions that were otherwise not required for the pioneering countries of western Europe and their offshoot populations of North America and Australia. The average educational attainment and spread of participation rates in the formal economy now need to be at a higher threshold for a country to sustain a productive demographic transition. The findings

from this study warrant several recommendations taking into consideration the prevailing macro conditions of Zimbabwe.

The stalls in the growth of secondary education attainment for men and women were associated with the slowing down and stalling of marital fertility transition. To sustain a desirable transition of fertility rates, the Zimbabwe government through the Ministry of Higher and Tertiary Education need to urgently grow the coverage of tertiary education opportunities. To create a platform to allow for this to happen, the government will be well advised to make primary and secondary education compulsory for all children. Such a policy transformation will also positively impact on the economy. Furthermore, formal education curricula can be transformed to inculcate a culture change with regards to desires for family size/number of children. This is because education can be an effective vehicle for cultural evolution and breaking intergenerational transmission of pronatal attitudes.

There is a relationship between employment in skilled employment and education, but also the issue of the economic outlook and the associated population dynamics (migration) are important. Zimbabwe attained independence from colonial rule in 1980 and it was expected that the involvement in skilled profession would rise in the population. The results from Figure Z1 show otherwise for different reasons. In the last 20 years, it is known that Zimbabwe has experienced significant brain drain with many skilled professionals leaving the country for better economic opportunities abroad. This has arguably diminished the segment of the country's population that make up the innovators. Consequently, the lack of a large enough critical mass of innovators to sustain progressive adoption and spread of new ideas about smaller families has arguably contributed to the stalling of fertility transition. The expansion of the reach of tertiary education need to be complemented with progressive economic policies that enable the retention of the skilled population. On top of facilitating marital fertility transition, this will position the country in good stead for a future demographic dividend.

TURITIN REPORT

DO.FILES

GHANA
*Weighting
gen wgt=v005/1000000
svyset [pw=wgt]

Myer's Index
*age distribution
gen n=_n
gen lastdigit = mod(v012, 10)
ta lastdigit [fw=n]

gen mw = 10
replace mw = v012+1 if v012 <9
replace mw = 99-v012 if v012 >89
replace mw = 0 if v012 >98

gen combow = _n*mw

tab lastdigit [fw=combow], matcell(blended)

*type the following straight on the command window
mata
 b = st_matrix("blended")
 f = 100 * b :/ sum(b)
 sum(abs(f :- 10))/2
 end

*VARIABLES
*DV
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ta v501
ta v501, nol
recode v501 (0=0 "no union") (1/2=1 "in union") (3/max=0 "no union"), gen(sample)

*ASMFRs
tabexp if sample==1, ageg(1) rates
*Check asmfrs schedule
twoway (scatter asmfr v012, sort) (line asmfr v012, sort)

*IVs
*Partner's job [problematic variable, skip for now]
ta v705
ta v705, nol
gen partnerjob =1 if v705==. & sample==1
replace partnerjob =2 if v705==1|v705==8
replace partnerjob =3 if v705==2|v705==3|v705==7
replace partnerjob =4 if v705==4|v705==5
replace partnerjob =5 if v705==9
la var partnerjob "partner's job"
la def partnerjob 1"unemployed" 2"skilled" 3"semiskilled" 4"agriculture" 5"unskilled", modify
la val partnerjob partnerjob

*Female employment
ta v717
ta v717, nol
recode v717 (0=1 "unemployed") (1=2 "skilled") (2/3=3 "semiskilled") (4/5=4 "agriculture") (7=3
"semiskilled") (8=2 "skilled") (9=5 "unskilled"), gen(occupation)
svy: ta occupation

```
*Socioeconomic Status SES
ta v190
svy:ta v190

*Religion
ta v130
ta v130, nol
recode v130 (1=1 "catholic") (2/4=2 "protestant") (5=3 "pentecostal") (6=4 "other") (7=5 "muslim") (96=5
"other religion") (8=6 "traditional") (9=7 "none"), gen(religion)
svy: ta religion

*Education - women
svy:ta v106

*Education - husband/partner
ta v701
ta v701, nol
recode v701 (0=1 "none") (1=2 "primary") (2=3 "secondary") (3=4 "tertiary") (8=.), gen(partneredu)
svy:ta partneredu

*Age at first union
ta v511

*Community-level variables - generated to be applied as continuous
*Education - women
recode v106 (0/1=0 "noedu/primary") (2/3=1 "secondary+"), gen(wedu) // makes education a dummy variable
bysort v001: egen weduclus=mean(wedu) //generates var (educlus) which is proportion with sec+ in each cluster

sum(weduclus) //continuous var

*Community-level of education - men
recode v701 (min/1=0 "noedu/primary") (2/3=1 "secondary+") (8=.), gen(medu) // makes education a dummy
variable
bysort v001: egen meduclus=mean(medu) //generates var (educlus) which is proportion with sec+ in each
cluster

sum(meduclus)

*Community-level of employment
        // - women
ta occupation, gen(dummy)
rename dummy1 fnone
rename dummy2 fskil
rename dummy3 fsemis
rename dummy4 fagric
rename dummy5 funskild
        //community-level of each category of employment status of females
bysort v001: egen fnon=mean(fnone)
bysort v001: egen fskld=mean(fskil)
bysort v001: egen fsemi=mean(fsemis)
bysort v001: egen fagri=mean(fagric)
bysort v001: egen funsk=mean(funskild)

        // - husbands [men]
ta partnerjob, gen(dummy)
rename dummy1 mnone
rename dummy2 mskil
rename dummy3 msemis
rename dummy4 magric
```

```
rename dummy5 munskild
        //community-level of each category of employment status of husbands/partners
bysort v001: egen mnon=mean(mnone)
bysort v001: egen mskld=mean(mskil)
bysort v001: egen msemi=mean(msemis)
bysort v001: egen magri=mean(magric)
bysort v001: egen munsk=mean(munskild)

*Level of urbanisation
ta v025
ta v025, nol
recode v025 (2=0 "rural") (1=1 "urban"), gen(urbanr) //level of urban residence - multilevel modelling
bysort v000: egen purban=mean(urbanr) //for application in decomposition only

*Husbands want more children
ta v621
ta v621, nol
impute v621 sample v106 if sample==1, gen(desirechildren)
ta desirechildren
recode desirechildren (1=1 "both same") (2/2.5=2 "husband more") (2.6/33=3 "husband less"), gen(desire)
rename v621 v6211
rename desire v621

gen hwmc=1 if v621==2
replace hwmc=0 if v621==1|v621==3
la def hwmc 1"hubby wants more" 0"both/wife wants more", modify
la var hwmc "husbands wants more children"
bysort v001:egen phwmc=mean(hwmc)
la var phwmc "proportion whose husbands want more" //for decomposition only

*PROXIMATE FACTORS
*Contraceptive
ta v364
ta v364, nol
recode v364 (3/4=1 "none") (1=2 "modern") (2=3 "traditional"), gen(contraceptive)
svy:ta contraceptive

*Abortion
ta v228
ta v228, nol
recode v228 (0=1 "no") (1=2 "yes") (9=.), gen(abortion)
svy:ta abortion

*Postpartum
ta v404
ta v404, nol
recode v404 (0=1 "no") (1=2 "yes"), gen(postpartum)
svy:ta postpartum

//
*Mortality
*From the birth recode
syncmrates v008 b3 b7 if v024==1 [iw=v005], cluster(v021) //produces mortality rates
syncmrates v008 b3 b7 if v024==2 [iw=v005], cluster(v021) //produces mortality rates
syncmrates v008 b3 b7 if v024==3 [iw=v005], cluster(v021) //produces mortality rates
syncmrates v008 b3 b7 if v024==4 [iw=v005], cluster(v021) //produces mortality rates
syncmrates v008 b3 b7 if v024==5 [iw=v005], cluster(v021) //produces mortality rates
syncmrates v008 b3 b7 if v024==6 [iw=v005], cluster(v021) //produces mortality rates
syncmrates v008 b3 b7 if v024==7 [iw=v005], cluster(v021) //produces mortality rates
syncmrates v008 b3 b7 if v024==8 [iw=v005], cluster(v021) //produces mortality rates
```

```
syncmrates v008 b3 b7 if v024==9 [iw=v005], cluster(v021) //produces mortality rates
syncmrates v008 b3 b7 if v024==10 [iw=v005], cluster(v021) //produces mortality rates

//then merge with the Individual recode by province
save, replace
///***///

syncmrates v008 b3 b7 [iw=v005], trend(60) plot(u5mr) //trends over 5 years preceding survey

*Alternatively
gen intage=(v008-b3)/12 //age at interview in years
gen timeyears=.
replace timeyears=intage
replace timeyears=b7/12 if b5==0
gen dead=(b5==0)
ltable timeyears dead if intage<5, int(1) gr //life table with graph of survivorships

sort v024
quietly by v024:egen pu5mr=() //provincial under-5 mortality rates
bysort v001:egen cu5mr=() //cluster-level under-5 mortality rates
*Multivariate analysis
*STANDARD REGRESSIONS
*Can't analyse ASFR because now only women with identified partners (husbands) can be included, hence all multivariate analyses are for ASMFR

*GDHS 1988
mixed asmfr i.(contraceptive postpartum v013 v106 occupation religion urbanr partneredu partnerjob) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v101 [pweight=wgt]
estimates store GDHS1988

*GDHS 1993
mixed asmfr i.(contraceptive postpartum v013 v106 occupation religion urbanr partneredu partnerjob v621) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]
estimates store GDHS1993

*GDHS 1998
mixed asmfr i.(contraceptive postpartum abortion v013 v106 occupation v190 religion urbanr partneredu partnerjob v621) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]
estimates store GDHS1998

*GDHS 2003
mixed asmfr i.(contraceptive postpartum abortion v013 v106 occupation v190 religion urbanr partneredu partnerjob v621) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]
estimates store GDHS2003

*GDHS 2008
mixed asmfr i.(contraceptive postpartum abortion v013 v106 occupation v190 religion urbanr partneredu partnerjob v621) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]
estimates store GDHS2008

*GDHS 2014-15
mixed asmfr i.(contraceptive abortion v013 v106 occupation v190 religion urbanr partneredu partnerjob v621) abstain amenor insusce imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]
mixed asmfr i.(contraceptive abortion v013 v106 occupation v190 religion urbanr partneredu partnerjob v621) postpa imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]
estimates store GDHS2014-15

*Plotting regression results
#delimit ;
coefplot GDHS1988 GDHS1993,
```

```
eform xscale(log range(-0.01 0.01)) omitted
xline(1, lcolor(green) lwidth(thin) lpattern(dash))
;

*DECOMPOSITION ANALYSIS
        // Mortality rates
syncmrates v008 b3 b7 [iw=v005], cluster(v001) //produces mortality rates using the method used in DHS reports
*Run the following in each dhs
gen decompimr=0.0771879 //imr 1988
gen decompu5mr=0.1547312 //u5mr 1988

gen decompimr=0.0664195 //imr 1993
gen decompu5mr=0.1194205 //u5mr 1993

gen decompimr=0.0567033 //imr 1998
gen decompu5mr=0.1075718 //u5mr 1998

gen decompimr=0.0642824 //imr 2003
gen decompu5mr=0.1111808 //u5mr 2003

gen decompimr=0.0502903 //imr 2008
gen decompu5mr=0.0800037 //u5mr 2008

gen decompimr=0.0412447 //imr 2014-15
gen decompu5mr=0.0598718 //imr 2014-15

*Period 1: 1988-1993
*group variable
gen group=0 if v000=="GH" //gdhs1988
replace group=1 if v000=="GH2" //gdhs1993
la def group 0"1988" 1"1993", modify
la val group group

ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

/*tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes */

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
```

```
rename dummy4 e4 //tertiary

tab occupation, gen(dummy) //female occupation
rename dummy1 m1 //not employed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled

ta religion, gen(dummy) //religion
rename dummy1 f1 //catholic
rename dummy2 f2 //protestant
rename dummy3 f3 //other christian
rename dummy4 f4 //muslim
rename dummy5 f5 //traditional
rename dummy6 f6 //none

/*ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile */

ta urbanr, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

/*ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less */

oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.d1 d2 d3 d4 d5 d6 d7) normalize(b.e1 e2 e3
e4) normalize(b.m1 m2 m3 m4 m5) normalize(b.f1 f2 f3 f4 f5 f6) normalize(b.h1 h2) normalize(b.j1 j2 j3 j4)
normalize(b.k1 k2 k3 k4 k5) imr u5mr weduclus meduclus if sample==1, by(group) noisily relax noisily svy

*Period 2: 1993-1998
*group variable : v000 has same code "RW4" in both surveys, so can't be used to distinguish the 2 surveys
gen group=0 if v000=="GH2" //1993
replace group=1 if v000=="GH3" //1998
la def group 0"1993" 1"1998", modify
la val group group

ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
```

```
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

/*tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes */

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

ta religion, gen(dummy) //religion
rename dummy1 f1 //catholic
rename dummy2 f2 //protestant
rename dummy3 f3 //pentecostal
rename dummy4 f4 //other
rename dummy5 f5 //muslim
rename dummy6 f6 //traditional
rename dummy7 f7 //none

/*ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile */

ta urbanr, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

impute v621 sample v106 if sample==1, gen(desirechildren)
ta desirechildren
```

```
recode desirechildren (1/1.29=1 "both same") (1.3/2=2 "husband more") (3=3 "husband less"), gen(desire)
rename v621 v6211
rename desire v621
ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less

tab occupation, gen(dummy) //female occupation
rename dummy1 m1 //not employed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled

oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.d1 d2 d3 d4 d5 d6 d7) normalize(b.e1 e2 e3
e4) normalize(b.m1 m2 m3 m4 m5) normalize(b.f1 f2 f3 f4 f5 f6 f7) normalize(b.h1 h2) normalize(b.j1 j2 j3 j4)
normalize(b.k1 k2 k3 k4 k5) normalize(b.l1 l2 l3) imr u5mr weduclus meduclus if sample==1, by(group) noisily
relax noisily svy

*Period 3: 2005-2010
*group variable
gen group=0 if v000=="GH3" //gdhs1998
replace group=1 if v000=="GH4" //rdhs2003
la def group 0"1998" 1"2003", modify
la val group group

*Preparing vars for decomposition
ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

ta religion, gen(dummy) //religion
rename dummy1 f1 //catholic
rename dummy2 f2 //protestant
rename dummy3 f3 //pentecost
```

```
rename dummy4 f4 //other
rename dummy5 f5 //muslim
rename dummy6 f6 //traditional
rename dummy7 f7 //none

ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile

ta v025, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

impute v621 sample v106 if sample==1, gen(desirechildren)
ta desirechildren
recode desirechildren (1/1.32=1 "both same") (1.35/2=2 "husband more") (3=3 "husband less"), gen(desire)
rename v621 v6211
rename desire v621
ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less

tab occupation, gen(dummy) //female occupation
rename dummy1 m1 //not employed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled

oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.c1 c2) normalize(b.d1 d2 d3 d4 d5 d6 d7)
normalize(b.e1 e2 e3 e4) normalize(b.m1 m2 m3 m4 m5) normalize(b.f1 f2 f3 f4 f5 f6 f7) normalize(b.g1 g2 g3
g4 g5) normalize(b.h1 h2) normalize(b.j1 j2 j3 j4) normalize(b.k1 k2 k3 k4 k5) normalize(b.l1 l2 l3) imr u5mr
weduclus meduclus if sample==1, by(group) noisily relax noisily svy

*Period 4: 2003-2008
*group variable
gen group=0 if v000=="GH4" //gdhs2003
replace group=1 if v000=="GH5" //rdhs2008
la def group 0"2003" 1"2008", modify
la val group group

ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
```

```
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

ta religion, gen(dummy) //religion
rename dummy1 f1 //catholic
rename dummy2 f2 //protestant
rename dummy3 f3 //pentecost
rename dummy4 f4 //other
rename dummy5 f5 //muslim
rename dummy6 f6 //traditional
rename dummy7 f7 //none

ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile

ta v025, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

impute v621 sample v106 if sample==1, gen(desirechildren)
```

```
ta desirechildren
recode desirechildren (1/1.39=1 "both same") (1.4/2=2 "husband more") (3=3 "husband less"), gen(desire)
rename v621 v6211
rename desire v621
ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less

tab occupation, gen(dummy) //female occupation
rename dummy1 m1 //not employed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled

oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.c1 c2) normalize(b.d1 d2 d3 d4 d5 d6 d7)
normalize(b.e1 e2 e3 e4) normalize(b.m1 m2 m3 m4 m5) normalize(b.f1 f2 f3 f4 f5 f6 f7) normalize(b.g1 g2 g3
g4 g5) normalize(b.h1 h2) normalize(b.j1 j2 j3 j4) normalize(b.k1 k2 k3 k4 k5) normalize(b.l1 l2 l3) imr u5mr
weduclus meduclus if sample==1, by(group) noisily relax noisily svy

*Period 5: 3008-2014-15
*group variable
gen group=0 if v000=="GH5" //gdhs2003
replace group=1 if v000=="GH6" //rdhs2008
la def group 0"2008" 1"2014", modify
la val group group

ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

ta religion, gen(dummy) //religion
rename dummy1 f1 //catholic
rename dummy2 f2 //protestant
rename dummy3 f3 //pentecost
```

```
rename dummy4 f4 //other
rename dummy5 f5 //muslim
rename dummy6 f6 //traditional
rename dummy7 f7 //none

ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile

ta v025, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

impute v621 sample v106 if sample==1, gen(desirechildren)
ta desirechildren
recode desirechildren (1/1.5=1 "both same") (1.51/2=2 "husband more") (3=3 "husband less"), gen(desire)
rename v621 v6211
rename desire v621
ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less

tab occupation, gen(dummy) //female occupation
rename dummy1 m1 //not employed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled

oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.c1 c2) normalize(b.d1 d2 d3 d4 d5 d6 d7)
normalize(b.e1 e2 e3 e4) normalize(b.m1 m2 m3 m4 m5) normalize(b.f1 f2 f3 f4 f5 f6 f7) normalize(b.g1 g2 g3
g4 g5) normalize(b.h1 h2) normalize(b.j1 j2 j3 j4) normalize(b.k1 k2 k3 k4 k5) normalize(b.l1 l2 l3) imr u5mr
weduclus meduclus if sample==1, by(group) noisily relax noisily svy
```

KENYA

```
*Weighting
gen wgt=v005/1000000
svyset [pw=wgt]

*VARIABLES
*Sample
recode v501 (0=0 "no union") (1/2=1 "in union") (3/5=0 "no union"), gen(sample)
```

```
*DV
*ASMFRs
tabexp if sample==1, ageg(1) rates

*Check distribution
twoway  (scatter asmfr v012, sort) (line asmfr v012, sort)

*IVs
*Contraceptive
recode v364 (3/4=1 "none") (1=2 "modern") (2=3 "traditional"), gen(contraceptive)

*Postpartum
recode v404 (0=1 "no") (1=2 "yes"), gen(postpartum)

*Abortion
recode v228 (0=1 "no") (1=2 "yes"), gen(abortion)

*Partner's job
gen partnerjob =1 if v705==0
replace partnerjob =2 if v705==1|v705==8
replace partnerjob =3 if v705==2|v705==7
replace partnerjob =4 if v705==4|v705==5
replace partnerjob =5 if v705==6|v705==9
replace partnerjob =. if v705==98
la var partnerjob "partner's job"
la def partnerjob 1"unemployed" 2"skilled" 3"semiskilled" 4"agriculture" 5"unskilled", modify
la val partnerjob partnerjob

*Female employment status
recode v717 (0=1 "unemployed") (1=2 "skilled") (2=3 "semiskilled") (4=4 "agriculture") (6=5 "unskilled") (7=3
"semiskilled") (8=2 "skilled") (9=5 "unskilled"), gen(occupation)
svy: ta occupation

*Socioeconomic Status SES
ta v190
svy:ta v190

*Contraceptive use
ta v364
svy:ta v364

*Religion
recode v130 (1=1 "catholic") (2=2 "other christian") (3=3 "muslim") (4=4 "no religion") (96=5 "other religion"),
gen(religion)
svy: ta religion

*Province [Syncronise with previous surveys]
rename v024 v0024
recode v0024 (1=3 "coast") (2=8 "north eastern") (3=4 "eastern") (4=2 "central") (5=6 "rift valley") (7=7
"western") (8=5 "nyanza") (9=1 "nairobi"), gen(v024)

*Education - women
svy:ta v106

*Education - husband/partner
recode v701 (0=1 "none") (1=2 "primary") (2=3 "secondary") (3=4 "tertiary") (8=.), gen(partneredu)
svy:ta partneredu

*Marital status - in union only
gen maristat =1 if v501==1
```

```
replace maristat =2 if v501==2
la var maristat "marital status"
la def maristat 1"married" 2"cohabiting" , modify
la val maristat maristat

svy:ta maristat

*Age at first union
ta v511

*Community-level variables - generated to be applied as continuous
*Education - women
recode v106 (0/1=0 "noedu/primary") (2/3=1 "secondary+") (8/9=.), gen(wedu) // makes education a dummy variable
bysort v001: egen weduclus=mean(wedu) //generates var (educlus) which is proportion with sec+ in each cluster

sum(weduclus) //continuous var

*Community-level of education - men
recode v701 (min/1=0 "noedu/primary") (2/3=1 "secondary+") (8/max=.), gen(medu) // makes education a dummy variable
bysort v001: egen meduclus=mean(medu) //generates var (educlus) which is proportion with sec+ in each cluster

sum(meduclus)

*Domestic violence: in the last 12 months
        //Physical violence
recode d105a (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(pushed)
recode d105b (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(slapped)
recode d105c (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(punched)
recode d105d (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(kicked)
recode d105e (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(strangled)
recode d105j (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(armtwisted)

pca pushed slapped punched kicked strangled armtwisted
predict pc1
bysort v001: egen pv=mean(pc1) //average level of physical violence at cluster level

        //Emotional violence
recode d103a (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(humiliated)
recode d103b (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(threatened)
recode d103c (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(insulted)

pca humiliated threatened insulted
predict score1
bysort v001: egen ev=mean(score1) //proportion of females with controlling husbands/partners

        //Sexual violence
recode d105h (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(sex)
recode d105i (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(sexacts)
recode d105k (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(forcedacts)

pca sex sexacts forcedacts
predict ff1
bysort v001: egen sv=mean(ff1) //proportion females who've experienced sexual violence in the last 12 months

*Community-level of employment
        // - women
ta occupation, gen(dummy)
```

```
rename dummy1 fnone
rename dummy2 fskil
rename dummy3 fsemis
rename dummy4 fagric
rename dummy5 funskild
        //community-level of each category of employment status of females
bysort v001: egen fnon=mean(fnone)
bysort v001: egen fskld=mean(fskil)
bysort v001: egen fsemi=mean(fsemis)
bysort v001: egen fagri=mean(fagric)
bysort v001: egen funsk=mean(funskild)

        // - husbands [men]
ta partnerjob, gen(dummy)
rename dummy1 mnone
rename dummy2 mskil
rename dummy3 msemis
rename dummy4 magric
rename dummy5 munskild
        //community-level of each category of employment status of husbands/partners
bysort v001: egen mnon=mean(mnone)
bysort v001: egen mskld=mean(mskil)
bysort v001: egen msemi=mean(msemis)
bysort v001: egen magri=mean(magric)
bysort v001: egen munsk=mean(munskild)

*Level of urbanisation
recode v025 (2=0 "rural") (1=1 "urban"), gen(urbanr) //level of urban residence - multilevel modelling
bysort v000: egen purban=mean(urbanr) //for application in decomposition only

*Husbands want more children
recode v621 8=. // - use v621 as a an individual-level variable in decomposition

gen hwmc=1 if v621==2
replace hwmc=0 if v621==1|v621==3
la def hwmc 1"hubby wants more" 0"both/wife wants more", modify
la var hwmc "husbands wants more children"
bysort v001:egen phwmc=mean(hwmc)
la var phwmc "proportion whose husbands want more" //for decomposition only

*Mortality rates
syncmrates v008 b3 b7 if v024==1 [iw=v005], cluster(v021)
syncmrates v008 b3 b7 if v024==2 [iw=v005], cluster(v021)
syncmrates v008 b3 b7 if v024==3 [iw=v005], cluster(v021)
syncmrates v008 b3 b7 if v024==4 [iw=v005], cluster(v021)
syncmrates v008 b3 b7 if v024==5 [iw=v005], cluster(v021)
syncmrates v008 b3 b7 if v024==6 [iw=v005], cluster(v021)
syncmrates v008 b3 b7 if v024==7 [iw=v005], cluster(v021)
syncmrates v008 b3 b7 if v024==8 [iw=v005], cluster(v021)

save, replace
*Multivariate analysis
*STANDARD REGRESSIONS
*Can't analyse ASFR because now only women with identified partners (husbands) can be included, hence all
multivariate analyses are for ASMFR

*KDHS 1989
*Empty model
mixed asmfr if sample==1, ||v001: [pweight=wgt]
```

```
*Full model
mixed asmfr i.(contraceptive postpartum v013 v106 occupation religion v025 partneredu partnerjob) imr u5mr
v511 weduclus meduclus if sample==1, ||v001: v101 [pweight=wgt]

*KDHS 1993
*Empty model
mixed asmfr if sample==1, ||v001: [pweight=wgt]

*Full model
mixed asmfr i.(contraceptive postpartum v013 v106 occupation v190 religion v025 partneredu partnerjob v621)
imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]

*KDHS 1998
*Empty model
mixed asmfr if sample==1, ||v001: [pweight=wgt]

*Full model
mixed asmfr i.(contraceptive postpartum abortion v013 v106 occupation v190 religion v025 partneredu
partnerjob v621) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]

*KDHS 2003-04
*Empty model
mixed asmfr if sample==1, ||v001: [pweight=wgt]

*Full model
mixed asmfr i.(contraceptive postpartum abortion v013 v106 occupation v190 religion v025 partneredu
partnerjob v621) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]

*KDHS 2008
*Empty model
mixed asmfr if sample==1, ||v001: [pweight=wgt]

*Full model
mixed asmfr i.(contraceptive postpartum abortion v013 v106 occupation v190 religion v025 partneredu
partnerjob v621) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]
*KDHS 2014
*Empty model
mixed asmfr if sample==1, ||v001: [pweight=wgt]

*Full model
mixed asmfr i.(contraceptive postpartum abortion v013 v106 occupation v190 religion v025 partneredu
partnerjob v621) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]

*DECOMPOSITION ANALYSIS
*Period 1: 1988-1994
*group var
gen group=0 if v000=="KE" //kdhs1989
replace group=1 if v000=="KE2" //kdhs1993
la def group 0"1989" 1"1993", modify
la val group group

ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes
```

```
/*tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes */

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

ta religion, gen(dummy) //religion
rename dummy1 f1 //catholic
rename dummy2 f2 //other christian
rename dummy3 f3 //muslim
rename dummy4 f4 //no religion
rename dummy5 f5 //other religion

ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile

ta v025, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband employment status
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

/*ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less */

ta femalejob, gen(dummy)
rename dummy1 m1 //not employed
rename dummy2 m2 //employed
```

```
oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.d1 d2 d3 d4 d5 d6 d7) normalize(b.e1 e2 e3 e4) normalize(b.m1 m2) normalize(b.f1 f2 f3 f4 f5) normalize(b.h1 h2) normalize(b.j1 j2 j3 j4) normalize(b.k1 k2 k3 k4 k5) imr u5mr weduclus meduclus if sample==1, by(group) noisily relax noisily svy

*Period 2: 1993-1998
*group variable
gen group=0 if v000=="KE2" //kdhs1993
replace group=1 if v000=="KE3" //kdhs1998
la def group 0"1993" 1"1998", modify
la val group group

ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

/*tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes */

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

ta religion, gen(dummy) //religion
rename dummy1 f1 //catholic
rename dummy2 f2 //other christian
rename dummy3 f3 //muslim
rename dummy4 f4 //none
rename dummy5 f5 //other

ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile

ta v025, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
```

```
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

impute v621 sample v106 if sample==1, gen(desirechildren)
ta desirechildren
recode desirechildren (1/1.36=1 "both same") (1.4/2=2 "husband more") (3=3 "husband less"), gen(desire)
rename v621 v6211
rename desire v621
drop l1 l2 l3
ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less

ta occupation, gen(dummy) //occupation
rename dummy1 m1 //unemployed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled

*run the syncmrates command sorting by province

oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.d1 d2 d3 d4 d5 d6 d7) normalize(b.e1 e2 e3
e4) normalize(b.m1 m2 m3 m4 m5) normalize(b.f1 f2 f3 f4 f5) normalize(b.g1 g2 g3 g4 g5) normalize(b.h1 h2)
normalize(b.j1 j2 j3 j4) normalize(b.k1 k2 k3 k4 k5) normalize(b.l1 l2 l3) imr u5mr weduclus meduclus if
sample==1, by(group) noisily relax noisily svy

*Period 3: 1998-2003
*group variable
gen group=0 if v000=="KE3" //kdhs1998
replace group=1 if v000=="KE4" //kdhs2003
la def group 0"1998" 1"2003", modify
la val group group

ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
```

```
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

ta religion, gen(dummy) //religion
rename dummy1 f1 //christian
rename dummy2 f2 //other
rename dummy3 f3 //none
rename dummy4 f4 //no religion
rename dummy5 f5 //other religion

ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile

ta v025, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

impute v621 sample v106 if sample==1, gen(desirechildren)
ta desirechildren
recode desirechildren (1/1.43=1 "both same") (1.5/2=2 "husband more") (3=3 "husband less"), gen(desire)
rename v621 v6211
rename desire v621
drop l1 l2 l3
ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less

ta occupation, gen(dummy) //occupation
rename dummy1 m1 //unemployed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled
```

```
oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.c1 c2) normalize(b.d1 d2 d3 d4 d5 d6 d7) normalize(b.e1 e2 e3 e4) normalize(b.m1 m2 m3 m4 m5) normalize(b.f1 f2 f3 f4 f5) normalize(b.g1 g2 g3 g4 g5) normalize(b.h1 h2) normalize(b.j1 j2 j3 j4) normalize(b.k1 k2 k3 k4 k5) normalize(b.l1 l2 l3) imr u5mr weduclus meduclus if sample==1, by(group) noisily relax noisily svy

*Period 4: 2003-2008
*group variable
gen group=0 if v000=="KE4" //kdhs2003
replace group=1 if v000=="KE5" //kdhs2008
la def group 0"2003" 1"2008", modify
la val group group

ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

ta religion, gen(dummy) //religion
rename dummy1 f1 //catholic
rename dummy2 f2 //other christian
rename dummy3 f3 //muslim
rename dummy4 f4 //no religion
rename dummy5 f5 //other religion

ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile

ta v025, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
```

```
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

impute v621 sample v106 if sample==1, gen(desirechildren)
ta desirechildren
recode desirechildren (1/1.44=1 "both same") (1.45/2=2 "husband more") (3=3 "husband less"), gen(desire)
rename v621 v6211
rename desire v621
drop l1 l2 l3
ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less

ta occupation, gen(dummy) //occupation
rename dummy1 m1 //unemployed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled

*infant mortality
gen imr=0.0646578 if v024==1 & v000=="KE4"
replace imr=0.0488784 if v024==2 & v000=="KE4"
replace imr=0.0805594 if v024==3 & v000=="KE4"
replace imr=0.0636644 if v024==4 & v000=="KE4"
replace imr=0.1354377 if v024==5 & v000=="KE4"
replace imr=0.0629412 if v024==6 & v000=="KE4"
replace imr=0.0760869 if v024==7 & v000=="KE4"
replace imr=0.0820441 if v024==8 & v000=="KE4"
replace imr=0.0632712 if v024==1 & v000=="KE5"
replace imr=0.0544854 if v024==2 & v000=="KE5"
replace imr=0.0568041 if v024==3 & v000=="KE5"
replace imr=0.0402584 if v024==4 & v000=="KE5"
replace imr=0.0777016 if v024==5 & v000=="KE5"
replace imr=0.0323766 if v024==6 & v000=="KE5"
replace imr=0.0561671 if v024==7 & v000=="KE5"
replace imr=0.0626707 if v024==8 & v000=="KE5"
la var imr "infant mortality rate"

*under 5 mortality
gen u5mr=0.0902192 if v024==1 & v000=="KE4"
replace u5mr=0.0552976 if v024==2 & v000=="KE4"
replace u5mr=0.1078508 if v024==3 & v000=="KE4"
replace u5mr=0.0896929 if v024==4 & v000=="KE4"
replace u5mr=0.2165806 if v024==5 & v000=="KE4"
replace u5mr=0.0799413 if v024==6 & v000=="KE4"
replace u5mr=0.1478838 if v024==7 & v000=="KE4"
replace u5mr=0.1374344 if v024==8 & v000=="KE4"
replace u5mr=0.0676631 if v024==1 & v000=="KE5"
replace u5mr=0.0680658 if v024==2 & v000=="KE5"
replace u5mr=0.0665417 if v024==3 & v000=="KE5"
```

```
replace u5mr=0.0521759 if v024==4 & v000=="KE5"
replace u5mr=0.1327888 if v024==5 & v000=="KE5"
replace u5mr=0.0413574 if v024==6 & v000=="KE5"
replace u5mr=0.0958349 if v024==7 & v000=="KE5"
replace u5mr=0.0792588 if v024==8 & v000=="KE5"
la var u5mr "under5mortality rates"

oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.c1 c2) normalize(b.d1 d2 d3 d4 d5 d6 d7)
normalize(b.e1 e2 e3 e4) normalize(b.m1 m2 m3 m4 m5) normalize(b.f1 f2 f3 f4 f5) normalize(b.g1 g2 g3 g4
g5) normalize(b.h1 h2) normalize(b.j1 j2 j3 j4) normalize(b.k1 k2 k3 k4 k5) normalize(b.l1 l2 l3) imr u5mr
weduclus meduclus if sample==1, by(group) noisily relax noisily svy

*Period 5: 2008-2014
*group variable
gen group=0 if v000=="KE5" //zdhs1994
replace group=1 if v000=="KE6" //zdhs1999
la def group 0"2008" 1"2014", modify
la val group group

ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

ta religion, gen(dummy) //religion
rename dummy1 f1 //catholic
rename dummy2 f2 //other christian
rename dummy3 f3 //muslim
rename dummy4 f4 //no religion
rename dummy5 f5 //other religion

ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile
```

```
ta v025, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

impute v621 sample v106 if sample==1, gen(desirechildren)
ta desirechildren
recode desirechildren (1/1.4=1 "both same") (1.41/2=2 "husband more") (3=3 "husband less"), gen(desire)
rename v621 v6211
rename desire v621
drop l1 l2 l3
ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less

ta occupation, gen(dummy) //occupation
rename dummy1 m1 //unemployed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled

oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.c1 c2) normalize(b.d1 d2 d3 d4 d5 d6 d7)
normalize(b.e1 e2 e3 e4) normalize(b.m1 m2 m3 m4 m5) normalize(b.f1 f2 f3 f4 f5) normalize(b.g1 g2 g3 g4
g5) normalize(b.h1 h2) normalize(b.j1 j2 j3 j4) normalize(b.k1 k2 k3 k4 k5) normalize(b.l1 l2 l3) imr u5mr
weduclus meduclus if sample==1, by(group) noisily relax noisily svy
```

RWANDA

```
*Weighting
gen wgt=v005/1000000
svyset [pw=wgt]

*VARIABLES
*DV
*Sample,
ta v501
ta v501, nol
recode v501 (0=0 "no union") (1/2=1 "in union") (3/max=0 "no union"), gen(sample)

*ASMFRs
tabexp if sample==1, ageg(1) rates
*Check asmfrs schedule
twoway  (scatter asmfr v012, sort) (line asmfr v012, sort)

*IVs
*Partner's job
```

```
ta v705
ta v705, nol
gen partnerjob =1 if v705==0
replace partnerjob =2 if v705==1|v705==8
replace partnerjob =3 if v705==2|v705==3|v705==7
replace partnerjob =4 if v705==4|v705==5
replace partnerjob =5 if v705==6|v705==9
la var partnerjob "partner's job"
la def partnerjob 1"unemployed" 2"skilled" 3"semiskilled" 4"agriculture" 5"unskilled", modify
la val partnerjob partnerjob

*Female employment
ta v717
ta v717, nol
recode v717 (0=1 "unemployed") (1=2 "skilled") (2/3=3 "semiskilled") (4/5=4 "agriculture") (6=5 "unskilled")
(7=3 "semiskilled") (8=2 "skilled") (9=5 "unskilled"), gen(occupation)
svy: ta occupation

*Socioeconomic Status SES
ta v190
svy:ta v190

*Religion
ta v130
ta v130, nol
recode v130 (1=1 "catholic") (2=2 "protestant") (3=3 "adventist") (4=4 "muslim") (5/6=5 "other religion")
(96=5 "other religion") (7=6 "none") (99=.), gen(religion)
svy: ta religion

*Education - women
svy:ta v106

*Education - husband/partner
ta v701
ta v701, nol
recode v701 (0=1 "none") (1=2 "primary") (2=3 "secondary") (3=4 "tertiary") (8=.), gen(partneredu)
svy:ta partneredu

*Age at first union
ta v511

*Community-level variables - generated to be applied as continuous
*Education - women
recode v106 (0/1=0 "noedu/primary") (2/3=1 "secondary+"), gen(wedu) // makes education a dummy variable
bysort v001: egen weduclus=mean(wedu) //generates var (educlus) which is proportion with sec+ in each cluster

sum(weduclus) //continuous var

*Community-level of education - men
recode v701 (min/1=0 "noedu/primary") (2/3=1 "secondary+") (8=.), gen(medu) // makes education a dummy
variable
bysort v001: egen meduclus=mean(medu) //generates var (educlus) which is proportion with sec+ in each
cluster

sum(meduclus)

*Community-level of employment
        // - women
ta occupation, gen(dummy)
rename dummy1 fnone
```

```
rename dummy2 fskil
rename dummy3 fsemis
rename dummy4 fagric
rename dummy5 funskild
        //community-level of each category of employment status of females
bysort v001: egen fnon=mean(fnone)
bysort v001: egen fskld=mean(fskil)
bysort v001: egen fsemi=mean(fsemis)
bysort v001: egen fagri=mean(fagric)
bysort v001: egen funsk=mean(funskild)

        // - husbands [men]
ta partnerjob, gen(dummy)
rename dummy1 mnone
rename dummy2 mskil
rename dummy3 msemis
rename dummy4 magric
rename dummy5 munskild
        //community-level of each category of employment status of husbands/partners
bysort v001: egen mnon=mean(mnone)
bysort v001: egen mskld=mean(mskil)
bysort v001: egen msemi=mean(msemis)
bysort v001: egen magri=mean(magric)
bysort v001: egen munsk=mean(munskild)

*Level of urbanisation
ta v025
ta v025, nol
recode v025 (2=0 "rural") (1=1 "urban"), gen(urbanr) //level of urban residence - multilevel modelling
bysort v000: egen purban=mean(urbanr) //for application in decomposition only

*Husbands want more children
ta v621
ta v621, nol
recode v621 8=. // - use v621 as a an individual-level variable in decomposition

gen hwmc=1 if v621==2
replace hwmc=0 if v621==1|v621==3
la def hwmc 1"hubby wants more" 0"both/wife wants more", modify
la var hwmc "husbands wants more children"
bysort v001:egen phwmc=mean(hwmc)
la var phwmc "proportion whose husbands want more" //for decomposition only

*PROXIMATE FACTORS
*Contraceptive
ta v364
ta v364, nol
recode v364 (3/4=1 "none") (1=2 "modern") (2=3 "traditional"), gen(contraceptive)
svy:ta contraceptive

*Abortion
ta v228
ta v228, nol
recode v228 (0=1 "no") (1=2 "yes") (9=.), gen(abortion)
svy:ta abortion

*Postpartum
ta v404
ta v404, nol
recode v404 (0=1 "no") (1=2 "yes"), gen(postpartum)
```

```
svy:ta postpartum

//
*Mortality
*From the birth recode
syncmrates v008 b3 b7 if v024==1 [iw=v005], cluster(v021) //produces mortality rates
syncmrates v008 b3 b7 if v024==2 [iw=v005], cluster(v021) //produces mortality rates
syncmrates v008 b3 b7 if v024==3 [iw=v005], cluster(v021) //produces mortality rates
syncmrates v008 b3 b7 if v024==4 [iw=v005], cluster(v021) //produces mortality rates
syncmrates v008 b3 b7 if v024==5 [iw=v005], cluster(v021) //produces mortality rates

//then in the Individual recode
*Under 5 mortality
gen u5mr=0.0316988 if v024==1
replace u5mr=0.0549674 if v024==2
replace u5mr=0.0508996 if v024==3
replace u5mr=0.039432 if v024==4
replace u5mr=0.0595046 if v024==5
la var u5mr "under5mortality"

*Infant mortality rate
gen imr=0.0217821 if v024==1
replace imr=0.0353964 if v024==2
replace imr=0.0342599 if v024==3
replace imr=.02672460 if v024==4
replace imr=0.0352808 if v024==5
la var imr "infant mortality rate"

syncmrates v008 b3 b7 [iw=v005], trend(60) plot(u5mr) //trends over 5 years preceding survey

*Alternatively
gen intage=(v008-b3)/12 //age at interview in years
gen timeyears=.
replace timeyears=intage
replace timeyears=b7/12 if b5==0
gen dead=(b5==0)
ltable timeyears dead if intage<5, int(1) gr //life table with graph of survivorships

sort v024
quietly by v024:egen pu5mr=() //provincial under-5 mortality rates
bysort v001:egen cu5mr=() //cluster-level under-5 mortality rates

*Multivariate analysis
*STANDARD REGRESSIONS
*Can't analyse ASFR because now only women with identified partners (husbands) can be included, hence all
multivariate analyses are for ASMFR

*RDHS 1992
*Empty model
mixed asmfr if sample==1, ||v001: [pweight=wgt]

*Full model
mixed asmfr i.(contraceptive postpartum v013 v106 occupation v190 religion urbanr partneredu partnerjob
v621) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]

*RDHS 2000
*Empty model
mixed asmfr if sample==1, ||v001: [pweight=wgt]

*Full model
```

```
mixed asmfr i.(contraceptive postpartum abortion v013 v106 occupation v190 urbanr partneredu partnerjob
v621) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]

*RDHS 2005
*Empty model
mixed asmfr if sample==1, ||v001: [pweight=wgt]

*Full model
mixed asmfr i.(contraceptive postpartum abortion v013 v106 occupation v190 religion urbanr partneredu
partnerjob v621) imr u5mr  v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]

*RDHS 2010
*Empty model
mixed asmfr if sample==1, ||v001: [pweight=wgt]

*Full model
mixed asmfr i.(contraceptive postpartum abortion v013 v106 occupation v190 religion urbanr partneredu
partnerjob v621) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]

*RDHS 2014-15
*Empty model
mixed asmfr if sample==1, ||v001: [pweight=wgt]

*Full model
mixed asmfr i.(contraceptive postpartum abortion v013 v106 occupation v190 religion urbanr partneredu
partnerjob v621) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]

*DECOMPOSITION ANALYSIS
/// *** ///
                                    // NO Period 1: [ First dhs was in 1992 ]
/// *** //

*Period 2: 1992-2000
*group variable
gen group=0 if v000=="RW2" //rdhs1992
replace group=1 if v000=="RW4" //rdhs2000
la def group 0"1992" 1"2000", modify
la val group group

ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

/*tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes */

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49
```

```
tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

tab occupation, gen(dummy) //female occupation
rename dummy1 m1 //not employed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled

/*ta religion, gen(dummy) //religion
rename dummy1 f1 //christian
rename dummy2 f2 //other
rename dummy3 f3 //none */

ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile

ta urbanr, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

impute v621 sample v106 if sample==1, gen(desirechildren)
ta desirechildren
recode desirechildren (1/1.55=1 "both same") (1.545/2=2 "husband more") (3=3 "husband less"), gen(desire)
rename v621 v6211
rename desire v621
drop l1 l2 l3
ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less

bysort v000:egen marry=mean(v511) //mean age at first marriage

oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.d1 d2 d3 d4 d5 d6 d7) normalize(b.e1 e2 e3
e4) normalize(b.h1 h2) normalize(b.m1 m2 m3 m4 m5) normalize(b.g1 g2 g3 g4 g5) normalize(b.j1 j2 j3 j4)
normalize(b.k1 k2 k3 k4 k5) normalize(b.l1 l2 l3) imr u5mr weduclus meduclus if sample==1, by(group) noisily
relax noisily svy
```

```
*Period 3: 2000-2005
*group variable : v000 has same code "RW4" in both surveys, so can't be used to distinguish the 2 surveys
gen group=0 if dhs==2000 //2000
replace group=1 if dhs==2005 //2005
la def group 0"2000" 1"2005", modify
la val group group

ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

/*ta religion, gen(dummy) //religion
rename dummy1 f1 //christian
rename dummy2 f2 //other
rename dummy3 f3 //none */

ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile

ta urbanr, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
rename dummy1 k1 //not employed
```

```
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

impute v621 sample v106 if sample==1, gen(desirechildren)
ta desirechildren
recode desirechildren (1/1.6=1 "both same") (1.61/2=2 "husband more") (3=3 "husband less"), gen(desire)
rename v621 v6211
rename desire v621
drop l1 l2 l3
ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less

tab occupation, gen(dummy) //female occupation
rename dummy1 m1 //not employed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled

oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.c1 c2) normalize(b.d1 d2 d3 d4 d5 d6 d7)
normalize(b.e1 e2 e3 e4) normalize(b.m1 m2 m3 m4 m5) normalize(b.g1 g2 g3 g4 g5) normalize(b.h1 h2)
normalize(b.j1 j2 j3 j4) normalize(b.k1 k2 k3 k4 k5) normalize(b.l1 l2 l3) imr u5mr weduclus meduclus if
sample==1, by(group) noisily relax noisily svy

*Period 4: 2005-2010
*group variable
gen group=0 if v000=="RW4" //rdhs2005
replace group=1 if v000=="RW6" //rdhs2010
la def group 0"2005" 1"2010", modify
la val group group

*Preparing vars for decomposition
ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
```

```
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

ta religion, gen(dummy) //religion
rename dummy1 f1 //catholic
rename dummy2 f2 //protestant
rename dummy3 f3 //adventist
rename dummy4 f4 //muslim
rename dummy5 f5 //other
rename dummy6 f6 //none

ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile

ta v025, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

impute v621 sample v106 if sample==1, gen(desirechildren)
ta desirechildren
recode desirechildren (1/1.54=1 "both same") (1.6/2=2 "husband more") (3=3 "husband less"), gen(desire)
rename v621 v6211
rename desire v621
drop l1 l2 l3
ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less

tab occupation, gen(dummy) //female occupation
rename dummy1 m1 //not employed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled

oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.c1 c2) normalize(b.d1 d2 d3 d4 d5 d6 d7)
normalize(b.e1 e2 e3 e4) normalize(b.m1 m2 m3 m4 m5) normalize(b.f1 f2 f3 f4 f5 f6) normalize(b.g1 g2 g3 g4
g5) normalize(b.h1 h2) normalize(b.j1 j2 j3 j4) normalize(b.k1 k2 k3 k4 k5) normalize(b.l1 l2 l3) imr u5mr
weduclus meduclus if sample==1, by(group) noisily relax noisily svy

*Period 5: 2010-2014/15
```

```
*group variable
gen group=0 if dhs==2010 //rdhs2010
replace group=1 if dhs==2014 //rdhs2014-15
la def group 0"2010" 1"2014/15", modify
la val group group

ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

ta religion, gen(dummy) //religion
rename dummy1 f1 //catholic
rename dummy2 f2 //protestant
rename dummy3 f3 //adventist
rename dummy4 f4 //muslim
rename dummy5 f5 //other religion
rename dummy6 f6 //none

ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile

ta v025, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
```

```
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

impute v621 sample v106 if sample==1, gen(desirechildren)
ta desirechildren
recode desirechildren (1/1.5=1 "both same") (1.51/2=2 "husband more") (3=3 "husband less"), gen(desire)
rename v621 v6211
rename desire v621
drop l1 l2 l3
ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less

tab occupation, gen(dummy) //female occupation
rename dummy1 m1 //not employed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled

oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.c1 c2) normalize(b.d1 d2 d3 d4 d5 d6 d7)
normalize(b.e1 e2 e3 e4) normalize(b.m1 m2 m3 m4 m5) normalize(b.f1 f2 f3 f4 f5 f6) normalize(b.g1 g2 g3 g4
g5) normalize(b.h1 h2) normalize(b.j1 j2 j3 j4) normalize(b.k1 k2 k3 k4 k5) normalize(b.l1 l2 l3) imr u5mr
weduclus meduclus if sample==1, by(group) noisily relax noisily svy
```

ZIMBABWE

```
*Weighting
gen wgt=v005/1000000
svyset [pw=wgt]

*VARIABLES
*DV
*Sample,
gen sample=1 if partnerjob !=.
replace sample=0 if partnerjob==.
la def sample 1"in union" 2"not union", modify
la val sample sample

*ASMFRs
tabexp if sample==1, ageg(1) rates
*ASFRs
tabexp, ageg(1) rates

*Compare distributions
twoway  (scatter asfr v012, sort) (line asfr v012, sort) ///
                (scatter asmfr v012, sort) (line asmfr v012, sort)

*IVs
*Partner's job
gen partnerjob =1 if v705==0
replace partnerjob =2 if v705==1|v705==8
replace partnerjob =3 if v705==2|v705==3|v705==7
replace partnerjob =4 if v705==4|v705==5
replace partnerjob =5 if v705==9|v705==6
replace partnerjob =. if v705==98
la var partnerjob "partner's job"
```

```
la def partnerjob 1"unemployed" 2"skilled" 3"semiskilled" 4"agriculture" 5"unskilled", modify
la val partnerjob partnerjob


recode v717 (0=1 "unemployed") (1=2 "skilled") (2/3=3 "semiskilled") (4/5=4 "agriculture") (6=5 "unskilled")
(7=3 "semiskilled") (8=2 "skilled") (9=5 "unskilled") (96/max=.), gen(occupation)
svy: ta occupation

*Socioeconomic Status SES
ta v190
svy:ta v190

*Contraceptive use
ta v364
svy:ta v364

*Religion
recode v130 (2=1 "catholic") (3=2 "protestant") (4=3 "pentecostal") (5=4 "apostolic") (6=5 "other christian")
(1=6 "other religion") (7=6 "other religion") (96=6 "other religion") (8=7 "none"), gen(religion)
svy: ta religion

*Education - women
svy:ta v106

*Education - husband/partner
recode v701 (0=1 "none") (1=2 "primary") (2=3 "secondary") (3=4 "tertiary") (8=.), gen(partneredu)
svy:ta partneredu

*Marital status - in union only
gen maristat =1 if v501==1
replace maristat =2 if v501==2
la var maristat "marital status"
la def maristat 1"married" 2"cohabiting" , modify
la val maristat maristat

svy:ta maristat

*Age at first union
ta v511

*Community-level variables - generated to be applied as continuous
*Education - women
recode v106 (0/1=0 "noedu/primary") (2/3=1 "secondary+") (8/9=.), gen(wedu) // makes education a dummy
variable
bysort v001: egen weduclus=mean(wedu) //generates var (educlus) which is proportion with sec+ in each cluster

sum(weduclus) //continuous var

*Community-level of education - men
recode v701 (min/1=0 "noedu/primary") (2/3=1 "secondary+") (8/max=.), gen(medu) // makes education a
dummy variable
bysort v001: egen meduclus=mean(medu) //generates var (educlus) which is proportion with sec+ in each
cluster

sum(meduclus)

*Domestic violence: in the last 12 months
        //Physical violence
recode d105a (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(pushed)
recode d105b (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(slapped)
```

```
recode d105c (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(punched)
recode d105d (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(kicked)
recode d105e (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(strangled)
recode d105j (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(armtwisted)

pca pushed slapped punched kicked strangled armtwisted
predict pc1
bysort v001: egen pv=mean(pc1) //average level of physical violence at cluster level

        //Emotional violence
recode d103a (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(humiliated)
recode d103b (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(threatened)
recode d103c (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(insulted)

pca humiliated threatened insulted
predict score1
bysort v001: egen ev=mean(score1) //proportion of females with controlling husbands/partners

        //Sexual violence
recode d105h (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(sex)
recode d105i (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(sexacts)
recode d105k (0=0 "no") (3=0 "no") (1/2=1 "yes"), gen(forcedacts)

pca sex sexacts forcedacts
predict f1
bysort v001: egen sv=mean(f1) //proportion females who've experienced sexual violence in the last 12 months

*Community-level of employment
        // - women
ta occupation, gen(dummy)
rename dummy1 fnone
rename dummy2 fskil
rename dummy3 fsemis
rename dummy4 fagric
rename dummy5 funskild
        //community-level of each category of employment status of females
bysort v001: egen fnon=mean(fnone)
bysort v001: egen fskld=mean(fskil)
bysort v001: egen fsemi=mean(fsemis)
bysort v001: egen fagri=mean(fagric)
bysort v001: egen funsk=mean(funskild)

        // - husbands [men]
ta partnerjob, gen(dummy)
rename dummy1 mnone
rename dummy2 mskil
rename dummy3 msemis
rename dummy4 magric
rename dummy5 munskild
        //community-level of each category of employment status of husbands/partners
bysort v001: egen mnon=mean(mnone)
bysort v001: egen mskld=mean(mskil)
bysort v001: egen msemi=mean(msemis)
bysort v001: egen magri=mean(magric)
bysort v001: egen munsk=mean(munskild)

*Level of urbanisation
recode v025 (2=0 "rural") (1=1 "urban"), gen(urbanr) //level of urban residence - multilevel modelling
bysort v000: egen purban=mean(urbanr) //for application in decomposition only
```

```
*Husbands want more children
recode v621 8=. // - use v621 as a an individual-level variable in decomposition

gen hwmc=1 if v621==2
replace hwmc=0 if v621==1|v621==3
la def hwmc 1"hubby wants more" 0"both/wife wants more", modify
la var hwmc "husbands wants more children"
bysort v001:egen phwmc=mean(hwmc)
la var phwmc "proportion whose husbands want more" //for decomposition only

*Sample
gen sample=1 if partnerjob ~=.
replace sample=0 if partnerjob==.


/// *** ///

*Mortality rates
syncmrates v008 b3 b7 if v024==1 [iw=v005], cluster(v021)
syncmrates v008 b3 b7 if v024==2 [iw=v005], cluster(v021)
syncmrates v008 b3 b7 if v024==3 [iw=v005], cluster(v021)
syncmrates v008 b3 b7 if v024==4 [iw=v005], cluster(v021)
syncmrates v008 b3 b7 if v024==5 [iw=v005], cluster(v021)
syncmrates v008 b3 b7 if v024==6 [iw=v005], cluster(v021)
syncmrates v008 b3 b7 if v024==7 [iw=v005], cluster(v021)
syncmrates v008 b3 b7 if v024==8 [iw=v005], cluster(v021)
syncmrates v008 b3 b7 if v024==9 [iw=v005], cluster(v021)
syncmrates v008 b3 b7 if v024==10 [iw=v005], cluster(v021)

*Multivariate analysis
*STANDARD REGRESSIONS
*Can't analyse ASFR because now only women with identified partners (husbands) can be included, hence all
multivariate analyses are for ASMFR

*ZDHS 1988
*Empty model
mixed asmfr if sample==1, ||v001: [pweight=wgt]

*Full model
mixed asmfr i.(contraceptive postpartum v013 v106 occupation religion v025 partneredu partnerjob) imr u5mr
v511 weduclus meduclus if sample==1, ||v001: [pweight=wgt]

*ZDHS 1994
*Empty model
mixed asmfr if sample==1, ||v001: [pweight=wgt]

*Full model
mixed asmfr i.(contraceptive postpartum abortion v013 v106 occupation v190 religion v025 partneredu
partnerjob v621) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]

*ZDHS 1999
*Empty model
mixed asmfr if sample==1, ||v001: [pweight=wgt]

*Full model
mixed asmfr i.(contraceptive postpartum abortion v013 v106 occupation v190 religion v025 partneredu
partnerjob v621) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]

*ZDHS 2005-06
*Empty model
```

```
mixed asmfr if sample==1, ||v001: [pweight=wgt]

*Full model
mixed asmfr i.(contraceptive postpartum abortion v013 v106 occupation v190 religion v025 partneredu
partnerjob v621) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]

*ZDHS 2010-11
*Empty model
mixed asmfr if sample==1, ||v001: [pweight=wgt]

*Full model
mixed asmfr i.(contraceptive postpartum abortion v013 v106 occupation v190 religion v025 partneredu
partnerjob v621) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]

*ZDHS 2015
*Empty model
mixed asmfr if sample==1, ||v001: [pweight=wgt]

*Full model
mixed asmfr i.(contraceptive postpartum abortion v013 v106 occupation v190 religion v025 partneredu
partnerjob v621) imr u5mr v511 weduclus meduclus if sample==1, ||v001: v024 [pweight=wgt]


*DECOMPOSITION ANALYSIS
*Period 1: 1988-1994
*group variable
gen group=0 if v000=="ZW" //zdhs1988
replace group=1 if v000=="ZW3" //zdhs1994
la def group 0"1988" 1"1994", modify
la val group group

ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

/*tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes */

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

/*tab occupation, gen(dummy) //female occupation
```

```
rename dummy1 m1 //not employed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled */

ta religion, gen(dummy) //religion
rename dummy1 f1 //christian
rename dummy2 f2 //other
rename dummy3 f3 //none

/*ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile */

ta v025, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta v024, gen(dummy) //province of residence
rename dummy1 i1 //manicaland
rename dummy2 i2 //mashonaland central
rename dummy3 i3 //mashonaland east
rename dummy4 i4 //mashonaland west
rename dummy5 i5 //matabeleland north
rename dummy6 i6 //matabeleland south
rename dummy7 i7 //midlands
rename dummy8 i8 //masvingo
rename dummy9 i9 //harare
rename dummy10 i10 //bulawayo

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

/*ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less */

oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.d1 d2 d3 d4 d5 d6 d7) normalize(b.e1 e2 e3
e4) normalize(b.m1 m2 m3 m4) normalize(b.f1 f2 f3) normalize(b.h1 h2) normalize(b.j1 j2 j3 j4)
normalize(b.k1 k2 k3 k4 k5) imr u5mr weduclus meduclus if sample==1, by(group) noisily relax noisily svy

*Period 2: 1994-1999
*group variable
gen group=0 if v000=="ZW3" //zdhs1994
replace group=1 if v000=="ZW4" //zdhs1999
```

```
la def group 0"1994" 1"1999", modify
la val group group

ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

ta religion, gen(dummy) //religion
rename dummy1 f1 //christian
rename dummy2 f2 //other
rename dummy3 f3 //none

ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile

ta v025, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled
```

```
impute v621 sample v106 if sample==1, gen(desirechildren)
recode desirechildren (1/1.71=1 "both same") (1.72/2=2 "husband more") (3=3 "husband less"), gen(desire)
rename v621 v6211
rename desire v621
ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less

tab occupation, gen(dummy) //female occupation
rename dummy1 m1 //not employed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled

oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.c1 c2) normalize(b.d1 d2 d3 d4 d5 d6 d7)
normalize(b.e1 e2 e3 e4) normalize(b.m1 m2 m3 m4 m5) normalize(b.f1 f2 f3) normalize(b.g1 g2 g3 g4 g5)
normalize(b.h1 h2) normalize(b.j1 j2 j3 j4) normalize(b.k1 k2 k3 k4 k5) normalize(b.l1 l2 l3) imr u5mr
weduclus meduclus if sample==1, by(group) noisily relax noisily svy

*Period 3: 1999-2005/06
*group variable
gen group=0 if v000=="ZW4" //zdhs1994
replace group=1 if v000=="ZW5" //zdhs1999
la def group 0"1999" 1"2005", modify
la val group group

***
*Adjusting religion in zdhs2005-06 to 1999 level
gen rel1=1 if ((v130>1 & v130<=6) & group==0)
replace rel1=2 if (v130==1 & group==0)
replace rel1=3 if (v130>6 & group==0)

gen rel2=1 if ((v130>1 & v130<=6) & group==1)
replace rel2=2 if ((v130==1 & group==1)|(v130==7 & group==1))
replace rel2=3 if (v130>7 & group==1)


gen religion=1 if (rel1==1|rel2==1)
replace religion=2 if (rel1==2|rel2==2)
replace religion=3 if (rel1==3|rel2==3)

la def religion 1"christian" 2"other" 3"none", modify
la val religion religion
***
ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes

tab v013, gen(dummy) //age group
```

```
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

ta religion, gen(dummy) //religion
rename dummy1 f1 //christian
rename dummy2 f2 //other
rename dummy3 f3 //none

ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile

ta v025, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta v024, gen(dummy) //province of residence
rename dummy1 i1 //manicaland
rename dummy2 i2 //mashonaland central
rename dummy3 i3 //mashonaland east
rename dummy4 i4 //mashonaland west
rename dummy5 i5 //matabeleland north
rename dummy6 i6 //matabeleland south
rename dummy7 i7 //midlands
rename dummy8 i8 //masvingo
rename dummy9 i9 //harare
rename dummy10 i10 //bulawayo

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

impute v621 sample v106 if sample==1, gen(desirechildren)
recode desirechildren (1/1.6=1 "both same") (1.61/2=2 "husband more") (3=3 "husband less"), gen(desire)
rename v621 v6211
rename desire v621
ta v621, gen(dummy) //husband desire for children
```

```
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less

tab occupation, gen(dummy) //female occupation
rename dummy1 m1 //not employed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled

oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.c1 c2) normalize(b.d1 d2 d3 d4 d5 d6 d7)
normalize(b.e1 e2 e3 e4) normalize(b.m1 m2 m3 m4 m5) normalize(b.f1 f2 f3) normalize(b.g1 g2 g3 g4 g5)
normalize(b.h1 h2) normalize(b.j1 j2 j3 j4) normalize(b.k1 k2 k3 k4 k5) normalize(b.l1 l2 l3) imr u5mr
weduclus meduclus if sample==1, by(group) noisily relax noisily svy

*Period 4: 2005/06-2010/11
*group variable
gen group=0 if v000=="ZW5" //zdhs1994
replace group=1 if v000=="ZW6" //zdhs1999
la def group 0"2005" 1"2010", modify
la val group group

ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

ta religion, gen(dummy) //religion
rename dummy1 f1 //catholic
rename dummy2 f2 //protestant
rename dummy3 f3 //pentecostal
rename dummy4 f4 //apostolic
rename dummy5 f5 //other christian
rename dummy6 f6 //other religion
rename dummy7 f7 //none
```

```
ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile

ta v025, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta v024, gen(dummy) //province of residence
rename dummy1 i1 //manicaland
rename dummy2 i2 //mashonaland central
rename dummy3 i3 //mashonaland east
rename dummy4 i4 //mashonaland west
rename dummy5 i5 //matabeleland north
rename dummy6 i6 //matabeleland south
rename dummy7 i7 //midlands
rename dummy8 i8 //masvingo
rename dummy9 i9 //harare
rename dummy10 i10 //bulawayo

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

impute v621 sample v106 if sample==1, gen(desirechildren)
recode desirechildren (1/1.55=1 "both same") (1.56/2=2 "husband more") (3=3 "husband less"), gen(desire)
rename v621 v6211
rename desire v621
ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less

tab occupation, gen(dummy) //female occupation
rename dummy1 m1 //not employed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled

oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.c1 c2) normalize(b.d1 d2 d3 d4 d5 d6 d7)
normalize(b.e1 e2 e3 e4) normalize(b.m1 m2 m3 m4 m5) normalize(b.f1 f2 f3 f4 f5 f6 f7) normalize(b.g1 g2 g3
g4 g5) normalize(b.h1 h2) normalize(b.j1 j2 j3 j4) normalize(b.k1 k2 k3 k4 k5) normalize(b.l1 l2 l3) imr u5mr
weduclus meduclus if sample==1, by(group) noisily relax noisily svy

*Period 5: 2010-2015
*group variable
gen group=0 if v000=="ZW6" //zdhs1994
```

```
replace group=1 if v000=="ZW7" //zdhs1999
la def group 0"2010" 1"2015", modify
la val group group

ta contraceptive, gen(dummy) //contraceptive
rename dummy1 a1 //none
rename dummy2 a2 //modern
rename dummy3 a3 //traditional

ta postpartum, gen(dummy) //postpartum [breastfeeding]
rename dummy1 b1 //no
rename dummy2 b2 //yes

tab abortion, gen(dummy) //abortion
rename dummy1 c1 //no
rename dummy2 c2 //yes

tab v013, gen(dummy) //age group
rename dummy1 d1 //15-19
rename dummy2 d2 //20-24
rename dummy3 d3 //25-29
rename dummy4 d4 //30-34
rename dummy5 d5 //35-39
rename dummy6 d6 //40-45
rename dummy7 d7 //45-49

tab v106, gen(dummy) //female education status
rename dummy1 e1 //none
rename dummy2 e2 //primary
rename dummy3 e3 //secondary
rename dummy4 e4 //tertiary

ta religion, gen(dummy) //religion
rename dummy1 f1 //catholic
rename dummy2 f2 //protestant
rename dummy3 f3 //pentecostal
rename dummy4 f4 //apostolic
rename dummy5 f5 //other christian
rename dummy6 f6 //other religion
rename dummy7 f7 //none

ta v190, gen(dummy) //wealth index
rename dummy1 g1 //lowest quintile
rename dummy2 g2 //second quintile
rename dummy3 g3 //middle quintile
rename dummy4 g4 //fourth quintile
rename dummy5 g5 //highest quintile

ta v025, gen(dummy) //rural-urban residence
rename dummy1 h1 //rural
rename dummy2 h2 //urban

ta v024, gen(dummy) //province of residence
rename dummy1 i1 //manicaland
rename dummy2 i2 //mashonaland central
rename dummy3 i3 //mashonaland east
rename dummy4 i4 //mashonaland west
rename dummy5 i5 //matabeleland north
rename dummy6 i6 //matabeleland south
rename dummy7 i7 //midlands
```

```
rename dummy8 i8 //masvingo
rename dummy9 i9 //harare
rename dummy10 i10 //bulawayo

ta partneredu, gen(dummy) //husband education status
rename dummy1 j1 //none
rename dummy2 j2 //primary
rename dummy3 j3 //secondary
rename dummy4 j4 //tertiary

ta partnerjob, gen(dummy) //husband ecmployment status
rename dummy1 k1 //not employed
rename dummy2 k2 //skilled
rename dummy3 k3 //semiskilled
rename dummy4 k4 //agriculture
rename dummy5 k5 //unskilled

impute v621 sample v106 if sample==1, gen(desirechildren)
recode desirechildren (1/1.626=1 "both same") (1.63/2=2 "husband more") (3=3 "husband less"), gen(desire)
rename v621 v6211
rename desire v621
ta v621, gen(dummy) //desire for children
rename dummy1 l1 //both want same
rename dummy2 l2 //husband wants more
rename dummy3 l3 //husband wants less

tab occupation, gen(dummy) //female occupation
rename dummy1 m1 //not employed
rename dummy2 m2 //skilled
rename dummy3 m3 //semiskilled
rename dummy4 m4 //agriculture
rename dummy5 m5 //unskilled

oaxaca asmfr normalize(b.a1 a2 a3) normalize(b.b1 b2) normalize(b.c1 c2) normalize(b.d1 d2 d3 d4 d5 d6 d7)
normalize(b.e1 e2 e3 e4) normalize(b.m1 m2 m3 m4 m5) normalize(b.f1 f2 f3 f4 f5 f6 f7) normalize(b.g1 g2 g3
g4 g5) normalize(b.h1 h2) normalize(b.j1 j2 j3 j4) normalize(b.k1 k2 k3 k4 k5) normalize(b.l1 l2 l3) imr u5mr
weduclus meduclus if sample==1, by(group) noisily relax noisily svy
```