Relationships between marriage and fertility transitions in sub-Saharan Africa

1.1 Introduction

Henry (1961) defined natural fertility as the fertility level which is observed when women make no attempt to limit fertility based on their parity. As populations move away from natural fertility, the importance of changing marriage rates for aggregate fertility trends is expected to decline (Bledsoe 1990; Bongaarts 1987; Tabutin and Schoumaker 2004), as women begin to exert deliberate controls on their reproduction and spend less time in marital unions. This may affect the fertility-inhibiting role of changing marriage patterns by modifying the gap in exposure to childbearing between single and married individuals.

In SSA, the past four to five decades have seen changes in both marriage and fertility patterns (Garenne and Macro 2008, Bongaarts 2007, Tabutin and Schoumaker 2004, Lesthaeghe 1989, Bongaarts 2008, Garenne 2008, Shapiro and Gebreselassie 2008, Bongaarts 2006). The two processes are connected because the total fertility rate (TFR) is a function of proportions marrying, as well as levels of marital and nonmarital fertility:

$$TFR = \sum_{i=15}^{49} ASFR_i = \sum_{i=15}^{49} (p_{si} \times f_{si}) + (p_{mi} \times f_{mi})$$

where p_{si} is the age-specific proportion of single women, p_{mi} is the age-specific proportion of married women, f_{si} is the age-specific nonmarital fertility rate and f_{mi} is the age-specific marital fertility rate at each age i. Inherently, upward or downward changes of proportions marrying and/or of the quantum of age-specific marital and nonmarital fertility should have some bearing on fertility. Yet, such fluctuations in proportions marrying and fertility rates of married and non-married individuals may offset each other's contribution to fertility to produce seemingly stable fertility conditions. Indeed Hayford (2005) finds that in the U.S. unchanging fertility rates between 1970 and 1999 concealed changes in the contributions of the underlying components of change.

In this study I examined fertility trends over the past four decades in six sub-Saharan African countries – Namibia, Zimbabwe, Kenya, Rwanda, Benin, and Nigeria; to explore the contributions of changing marriage patterns to observed fertility trends. I asked and answered three questions concerning fertility and marriage transitions in sub-Saharan Africa:

(a) To what degree, and in what direction, have changes in rates of marriage, polygyny, cohabitation, divorce, widowhood, and abstention from marriage impacted fertility changes?

(b) How large are the effects of changing fertility rates of single and married women on overall fertility trends; and do these effects have positive, negative or no influence on fertility changes?

(c) How do the effects of changing marriage and fertility rates on fertility change differ by age?

Understanding effects of changing marriage patterns on fertility is important for identifying target populations for fertility interventions. I illustrate this point with an example: suppose that all births occurred to married women. Then

$$TFR = \sum_{i=15}^{49} p_{mi} \times f_{mi}$$

Intrinsically, changes in the overall fertility rate between two surveys would be effected by changes in marriage rates and/or in the quantity of marital fertility. If the TFR doubled between two surveys, this would occur if either: 1) the proportion marrying ($\boldsymbol{p_{mi}}$) doubled, but women still had the same fertility rates ($\boldsymbol{f_{mi}}$); or 2) the proportion married ($\boldsymbol{p_{mi}}$) stayed the same, but fertility rates (f_{mi}) doubled; or 3) this could have occurred though some combination of change in the two factors. Similarly, changes in overall levels of nonmarital fertility can occur if proportions nonmarried change, or if fertility rates of nonmarried women change, or as a result of changes in both factors. This logic can be useful for tracking contributions of the components of fertility to overall trends over time by paying attention to the magnitude and direction of such effects. These can be compared to expected effects to highlight marital subgroups which require additional attention in fertility interventions; or to gauge the fertility implications of increasing the legal age at marriage.

1.2 Prior research on changing nuptiality and fertility patterns

Previous studies on the evolution of the relationship between changing marriage patterns and fertility have often used decomposition methods to disentangle the effects of various factors on overall fertility. Some of the earlier work examining the contribution of changing marriage patterns to changing fertility was conducted by Coale (1967). Coale's model relied on three indices (commonly known as the Princeton Indices): 1) the index of total fertility, I_f; 2) the index of marital fertility I_g,; and 3) the index of proportions married, I_m. I_f is the ratio of total observed births to the number that would have been observed if the population of women had experienced the fertility schedule of married Hutterite women; I_g is the ratio of observed marital births to those that would have been observed if the married women had experienced Hutterite fertility; and I_m is the ratio of expected births to married women to that of all women if both sets of women experienced Hutterite fertility. In this model,

$$I_f = I_g \times I_m$$

In the model, observed total fertility captured both the deviation of marital fertility from its possible maximum (I_g) and the degree to which marriage deviates from universality among women (I_m). To incorporate nonmarital childbearing, Coale extended the model such that:

$$I_f = I_g I_m + (1 - I_m) I_n$$

where $(1 - I_m) I_n$ captured nonmarital childbearing. I_n, the index of nonmarital fertility, is the ratio of observed nonmarital births to the number that would have been observed if nonmarried women had experienced Hutterite fertility. ($1-I_m$) is the index of proportions nonmarried.

Although Coale's model has been useful for the development of other models, its disadvantage is that it uses the fertility schedule of Hutterite women, i.e. one would have to know the fertility schedule of married Hutterite women in order to use the model. Additionally, this Hutterite population may not necessarily be appropriate as a standard in all populations.

Perhaps the most prolific method for analyzing effects of changing marriage patterns on fertility in SSA is been the proximate determinants framework developed by Bongaarts (Bongaarts 1978, 1982; Bongaarts and Potter 1983). In this framework, Bongaarts built on Coale's (1967) and Davis and Blake's (1956) work to create a model which explains the contributions of the immediate or proximate determinants of fertility to fertility change. Davis and Blake identified eleven variables which had a bearing on fertility, either directly or indirectly. As several of the variables in the framework developed by Davis and Blake were not variant in different populations or had only slight effects on fertility changes, Bongaarts' framework reduced the eleven factors, first into seven (Bongaarts 1978), and then into four (Bongaarts 1982); namely proportion married among women, contraceptive use, abortion (induced), and postpartum infecundity. The proximate determinants framework uses four indices to explain how these four factors consecutively reduce fertility from its maximum:

$$TFR = C_m \times C_c \times C_a \times C_i \times TF$$

TF is total fecundity rate, C_m is the index of proportions married, C_c is the index of contraception, C_a is the index of induced abortion, and C_i is the index of postpartum infecundability (Bongaarts 1982). The indices capture the degree to which having less than universal marriage in a population, as well as practices of contraceptive use, induced abortion, and postpartum infecundability, respectively, result in lower than maximum fertility. The effect of changes in proportions of married women, $C_m = TFR/TM$, where TFR is the total fertility rate and TM is the total marital fertility rate. C_m is therefore interpreted as the fertility-inhibiting effect of nonmarriage, which reduces exposure to sex, and thus to conception and childbearing. In other words, if all women married, then TFR would equal TM, and C_m would be one.

The major drawback of the proximate determinants framework is that it assumes that childbearing occurs inside marriage; where marriage is defined as a union – marital or otherwise. In other words, the model assumes that all fertility occurs only to women who are in marriage or other consensual sexual relationships. It therefore ignores childbearing which occurs to single unattached women (Jolly and Gribble 1993). In addition, the model assumes that exposure to sex is similar for all women encompassed in the ‘marriage’ category (for example polygynously married women vs. women in monogamous marriages vs. cohabitating women, and so on). This may not be true, as discussed in the previous chapter.

Jolly and Gribble (1993) adjusted Bongaarts’ framework to include an additional term (M_0) which accounted for the fertility of nonmarried women, i.e. women who were not in consensual unions. M_0 is the ratio of the TFR to the total marital fertility rate. It is therefore the degree to which nonmarital childbearing increases the TFR over what it would have been if all births were marital. This factor adjusted Bongaarts’ index of proportions married C_m to include the fertility of unattached women. If all births occurred to married women, then M_0 would be unity, and the adjusted C_m would be the same as in Bongaarts’ model. This model, however, still convolutes the sexual experiences of women in different unions.

Another adjustment to the proximate determinants framework was proposed by Stover (1998). Stover suggested using sexual activity rather than marriage as a marker for exposure to childbearing. This way, Stover wanted to integrate the sexual activities of unattached women into the model; and to account for differences in sexual frequency among women in different types of unions. However, as Stover acknowledges, using this variable, may very likely introduce considerable error into the model: reports of sexual activity in surveys in SSA have been found to be less than reliable (for example Cremin et al. 2009; Curtis and Sutherland 2004; Helleringer et al. 2011; Poulin 2010). Further, using this variable confounds sexual experiences of women of different relationship statuses; i.e. we are unable to differentiate sexual activities for women in different union statuses.

A different method was used by Harwood-Lejeune (2001), who examined effects of changes in age at first marriage, and age-specific levels of pre- and post-marital fertility on changes in fertility in the four-year period leading up to a survey in the DHS. The analysis examined fertility changes in nine countries in East and Southern Africa, including Kenya (1998 survey), Namibia (1992 survey), and Zimbabwe (1994 survey). Drawing from Coale’s (1967) model, Harwood-Lejeune expressed the age-specific fertility rate as a function of pre- and post-marital fertility ($ASFR_{pre}$ and $ASFR_{post}$, respectively), and proportions never (p_{pre}) and ever (p_{post}) married, respectively:

$$ASFR = \left(p_{pre} \times ASFR_{pre}\right) + \left(p_{post} \times ASFR_{post}\right)$$

Unlike Coale, Harwood-Lejeune did not, however, standardize fertility schedules using Hutterite fertility.

Although the method used in the current paper is fairly similar to that used by Harwood-Lejeune (2001), there are fundamental differences. First, whereas Harwood-Lejeune's analyses only included countries in East and Southern Africa during a period of fertility decline; I incorporated West African countries and focused on all periods, regardless of the trajectory of fertility. Second, rather than examine fertility changes in consecutive years in the four-year period leading up to each survey as Harwood-Lejeune did, I examined longer-term fertility changes by examining changes in fertility between consecutive surveys in each country. In addition, while the previous study examined changes in fertility only for women aged 15-39, I included all women aged 15-44. Fourth, Harwood-Lejeune's study examined only changes in age-specific fertility rates (and not in overall fertility), nor did the analyses take into account the effects of changes in age-distribution; all of which are incorporated into the current analysis. Age distribution changes have been included in this analysis because age structure, through population momentum, is expected to be important for future fertility trends (Keyfitz 1971). Finally, while Harwood-Lejeune examined effects of changes in marriage rates, and in pre- and post-marital fertility, I have examined separately pre-marital (never married women), cohabitation, currently married, and formerly married behavior, because we obtain more information on the effects of changes among these different marital groups.

Many authors have attributed fertility changes in SSA to changes in the fertility rates of married women (Harwood-Lejeune 2001; Hinde and Mturi 2000; Kirk and Pillet 1998); changes in marriage patterns have not been found to have a large an effect as effects which reduce the fertility of married women (Garenne and Macro 2008; Jolly and Gribble 1993; Westoff, Bietsch and Koffman 2013).

Concerns about the fertility of adolescents have ensured that a large body of research on the effects of changing nuptiality patterns has focused on the fertility of adolescents (Bledsoe and Cohen 1993; Council 2005; Gage and Meekers 1994; Garenne, Tollman and Kathleen 2000; Garenne and Zwang 2006; Garenne and Zwang 2008; Harwood-Lejeune 2001; Meekers 1994; Mensch, Grant and Blanc 2005) . Adolescent childbearing in sub-Saharan Africa has traditionally occurred to married women because of low ages at marriage (Bledsoe 1990; Bledsoe 1994; Caldwell and Caldwell 1987; Clark 2004; Gage and Meekers 1994; Lesthaeghe 1989; Mensch et al. 2005). The focus on adolescent fertility changes have therefore often been on whether increasing age at marriage would lead to lower fertility in this group of women due to postponement of childbearing; or if fertility would be deferred to single adolescents (Mensch et al. 2005). Studies which have examined the contributions of changing marriage patterns to fertility at these ages have found national variation in effects. Harwood-Lejeune (2001) determined that changes in pre-marital fertility did not have much of an effect on fertility changes, but that the effect of increasing age at entry into marriage on fertility changes was between one sixth and a third of total fertility change.

Mensch, Grant et al. (2005) found that this dynamic was different in different countries: for example, the predominant effect in Benin and Namibia were declining fertility rates, whereas in Rwanda both changing marriage and fertility rates had a substantial effect on fertility, while in Nigeria changing marriage rates had the larger effect. Jolly and Gribble (1993) found that declining marriage rates at younger ages or increasing age at marriage had more substantial effects on the fertility of younger women (15 to 24 year olds). At older ages, this effect was attenuated; and fertility changes were mainly affected by contraceptive use patterns.

1.3 Research Hypotheses

Changes in marriage rates should affect fertility to the degree to which exposures to sexual intercourse differ between women in different marital statuses. Models of fertility change have generally presumed that sex is more prevalent among married than single women (Bongaarts 1978). In addition, divorce and widowhood presumably disrupt childbearing, such that we expect increasing divorce and widowhood to have negative effects on fertility. Overall, therefore, the decline in proportions marrying is expected to lower fertility. The literature is ambiguous about the effect of declining polygyny rates on fertility (Bledsoe 1990; Bledsoe 1994; Ezeh 1997; Garenne and Macro 2008; Pebley and Mbugua 1989; Tabutin and Schoumaker 2004).

The effects of changing rates of entering into marriage are likely to be greater among younger than older women, because many women who marry will do so at the younger ages (see Appendix 1 in Introduction for median age at marriage). Changes in rates of polygyny, cohabitation, divorce, and widowhood will likely have a larger effect on the fertility of older women than of younger women because these events tend to occur to women at the older ages. The effects of changing levels of marital and nonmarital fertility will be larger for women in the middle ages, because fertility is concentrated in these age groups (Appendix 4). Changing nonmarital fertility is expected to have a larger impact on fertility at younger ages.

Our expectations regarding the relative contributions of changing marriage and age-specific fertility rates to fertility trends derive from remarks about the declining importance of age at entry into marriage and proportions marrying as fertility declines. We therefore expect that countries with lower fertility levels will exhibit less importance of marriage rate changes than countries with higher fertility.

1.2 Data

I used nationally representative cross-sectional DHS data from six countries in SSA, all of which have had at least three surveys in the past few decades (Figure 1-2). The countries selected into the analyses (Namibia and Zimbabwe, Kenya and Rwanda, and Benin and Nigeria) are three pairs of countries wherein each pair has exhibited similar levels and trajectories of national level fertility in the past few decades (Figure 1-3). I designed the study this way so as to compare countries at different levels of fertility; but also to examine for similarities and differences in the relationship between fertility and marriage changes in countries with similar levels and trends of fertility.

Figure 1-2: Case study countries

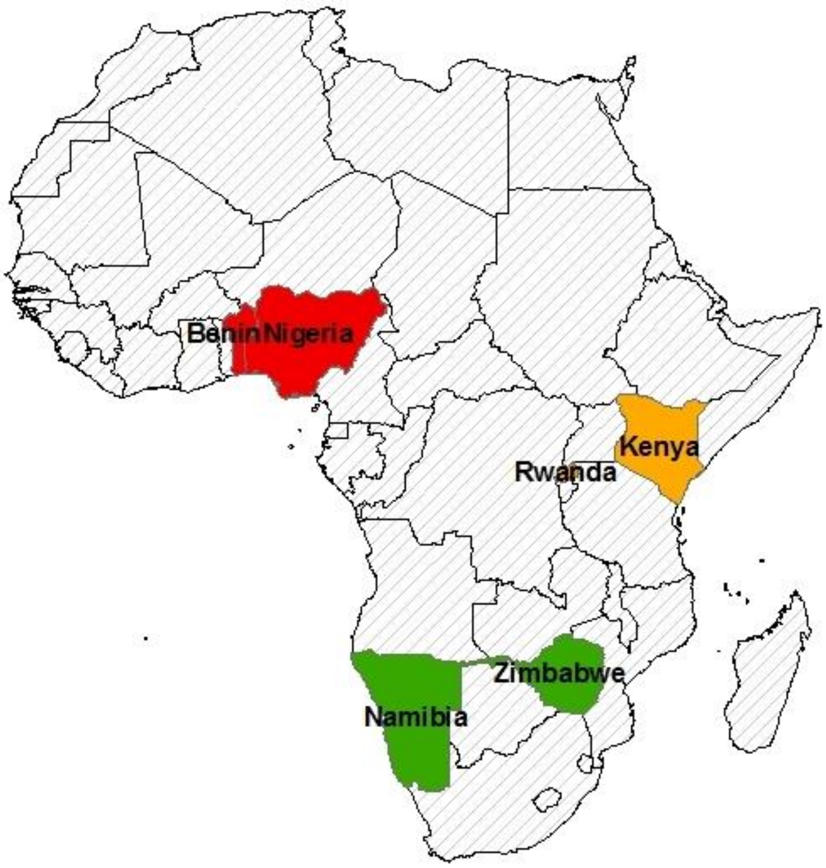
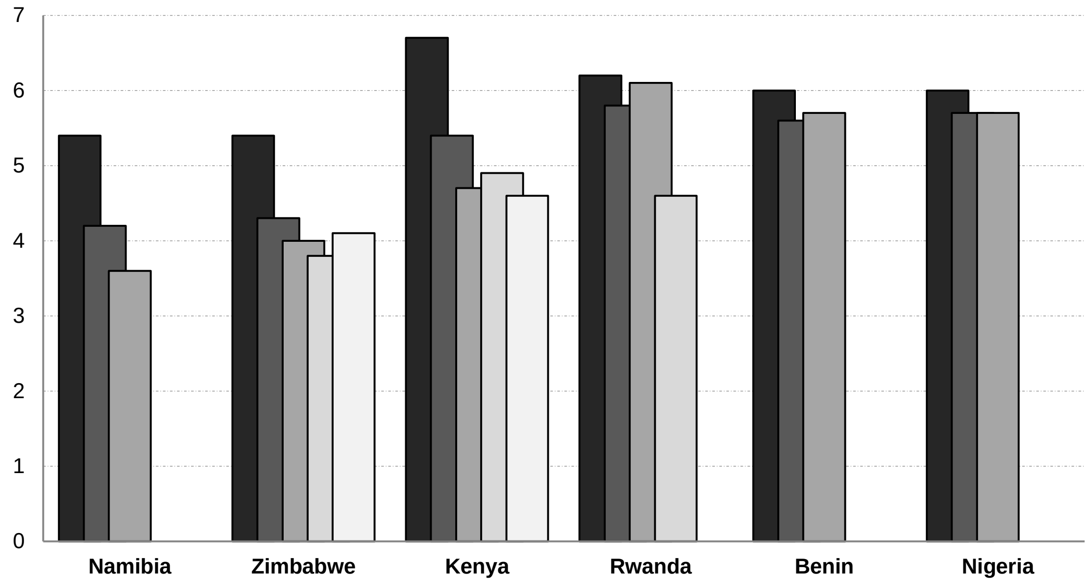


Figure 1-3: Total fertility rates in the six case studies

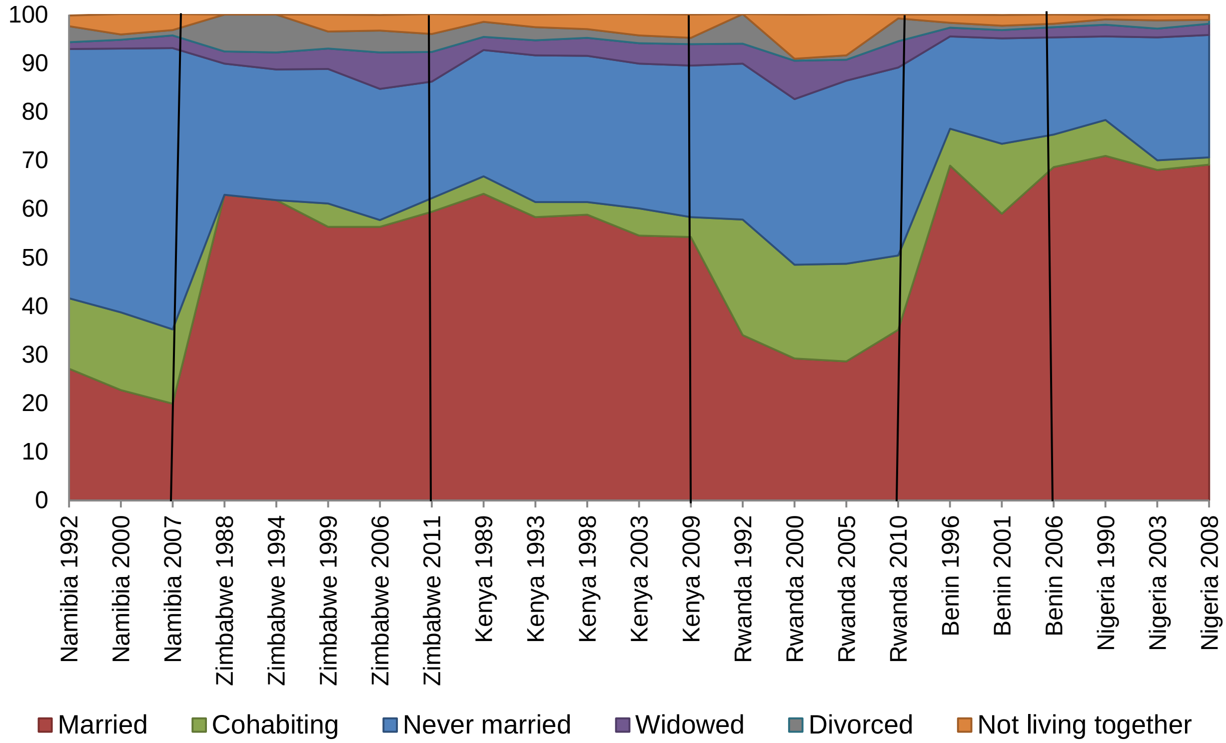


Survey dates, in order: Namibia-1992, 2000, 2007. Zimbabwe-1988/89, 1994, 1999, 2005/06, 2010/11. Kenya-1989, 1993, 1998, 2003, 2008/9. Rwanda-1992, 2000, 2005, 2010. Benin-1996, 2001, 2006. Nigeria-1990, 2003, 2008.

Namibia and Zimbabwe have the lowest levels of fertility among the six countries. Both countries have experienced a similar fertility decline, all up to the latest survey in Zimbabwe in which fertility went up (the survey dates in the two countries are not matched). Similarly, Kenya and Rwanda have had a similar fertility trajectory; in which fertility declined, then went up before declining again to end up at the same level of fertility. In Benin and Nigeria, the TFR has been fairly stagnant between 5.6 and 6 children per women over multiple rounds of surveys.

These pairs of countries, even though matched on fertility, have had different marriage profiles over time as shown in Figure 1-4. Figure 1-4 shows point prevalence estimates of proportions of women in each marital status in consecutive surveys in each country. The majority of women in each survey in Namibia had never married, and this proportion increased over time at the expense of proportions married. About 10% of women were in cohabiting unions, and this proportion appeared to be stable over time. Rwanda also had a relatively small proportion of women who were in marital relationships. This proportion decreased at first but it increased between the last two surveys, all at the expense of percent cohabiting. Proportion of never married women increased over time in Rwanda, and they were almost as equal in size to proportions married. Rwanda has had large proportions of women cohabiting – about a 10 percent of the population of women of childbearing age.

Figure 1-4: Marriage profiles in the six case studies: proportions in each marital status by survey



In Zimbabwe, Kenya, Benin, and Nigeria, the majority of women of childbearing age in each survey were currently married. In Zimbabwe and Nigeria changes in these proportions have been small, while in Kenya and Benin there have been appreciable changes in the proportions of married women. The rest of the women in these four countries were mainly those who had never married. Zimbabwe and Kenya had small proportions of cohabitors, but in Benin, proportions cohabiting were larger and increasing. In Nigeria, cohabitation declined over time. All six countries had small proportions of formerly married women, which may have occurred because of frequent remarriage of widows and divorcees.

For my analyses, I used the marital status of a woman as reported at the time of survey. This variable for current status has the following categories: currently married, never married, cohabiting, divorced, widowed, and not living together. I combined the ‘divorced’ and the ‘not living together’ categories. Polygynous status of married women was determined from a separate variable. There were a small number of women who were not sure if they were in polygynous marriages, and I incorporated them into the monogamous category. The marital status variable was not always consistently coded across surveys. For instance, the first three surveys in Zimbabwe did not ask questions about whether marriage was monogamous or polygynous, and cohabitation was not always documented as a separate category. From the questions women were asked about the children they had borne, I focused on births they had in the three years preceding each survey. I assumed that when these births occurred, the women were in the same marital status as at the time of survey.

1.3 Methods

1.3.1 Decomposing overall fertility changes

To examine the changing role of marriage patterns for fertility trends, I decomposed changes in the fertility rate across consecutive surveys into the contribution of each of its components. I used a decomposition method proposed by Das Gupta (1993), and built on an application of the method to decompose GFR changes that was used by Hayford (2005). By definition, for women aged 15-44:

$$GFR = \frac{total\ births}{total\ exposure} = \frac{marital\ births + nonmarital\ births}{total\ exposure}$$

$$= \frac{(marital\ exposure \times marital\ fertility\ rate) + (nonmarital\ exposure \times nonmarital\ fertility\ rate)}{total\ exposure}$$

$$= \frac{(total\ exposure\ \times marriage\ rate \times marital\ fertility\ rate) + (total\ exposure\ \times nonmarriage\ rate \times nonmarital\ fertility\ rate)}{total\ exposure}$$

Summing over each five-year age group, then

$$\boldsymbol{GFR} = \sum_{\boldsymbol{i}=\boldsymbol{15}}^{\boldsymbol{44}} \boldsymbol{C_i}(\boldsymbol{p_{mi}} \times \boldsymbol{f_{mi}} + \boldsymbol{p_{si}} \times \boldsymbol{f_{si}}) = \sum_{\boldsymbol{i}=\boldsymbol{15}}^{\boldsymbol{44}} \boldsymbol{C_i}(\boldsymbol{p_{mi}} \times \boldsymbol{f_{mi}} + (\boldsymbol{1} - \boldsymbol{p_{mi}}) \times \boldsymbol{f_{si}})$$

where C_i is the proportion of the population of 15-44 year old women aged i. The change in the GFR is the sum of the effects of each of these four components.

1.3.2 Das Gupta's decomposition method

Das Guptas' (1991, 1993) method's central mechanism of decomposition is standardization. Standardization is used to control for differential composition in the two populations in consecutive surveys. To implement this method, I decomposed changes in the GFR by standardizing the GFR, alternately by all factors except 1) age-specific levels of marital fertility; 2) age-specific levels of nonmarital fertility; 3) proportion of women in each age group who are married (or not married); and 4) the age-distribution of women between ages 15 and 44 (Das Gupta 1991; Das Gupta 1993; Hayford 2005). For each country, I constructed GFRs at different time points (surveys); and the change in the GFR between two surveys is the sum of the effects of all components:

$$GFR_2 - GFR_1 = C_i \text{effect} + p_m \text{ effect} + f_m \text{ effect} + f_s \text{ effect}$$

where time 2 is the latter survey and time 1 is the earlier.

I illustrate the standardization process by showing how the effect of C_i was determined. I use the notation and formulae used by Das Gupta (1991). If we assume that p_m, f_m, and f_s stay constant between surveys 1 and 2, then the standardized rate with respect to all other factors but the age-distribution will be:

At survey 1:

$$\mathrm{Q}(C_{i1}) = \frac{\mathrm{GFR}(C_{i1,}p_{m2,}\, f_{m2}, f_{s2}) + \mathrm{GFR}(C_{i1,}p_{m1,}\, f_{m1}, f_{s1})}{4}$$

$$+ \frac{\mathrm{GFR}(C_{i1,}p_{m2,}\, f_{m2}, f_{s1}) + \mathrm{GFR}(C_{i1,}p_{m2,}\, f_{m1}, f_{s2}) + \mathrm{GFR}(C_{i1,}p_{m1,}\, f_{m2}, f_{s2})}{12}$$

$$+ \frac{\mathrm{GFR}(C_{i1,}p_{m1,}\, f_{m1}, f_{s2}) + \mathrm{GFR}(C_{i1,}p_{m1,}\, f_{m2}, f_{s1}) + \mathrm{GFR}(C_{i1,}p_{m2,}\, f_{m1}, f_{s1})}{12}$$

where GFR( ) is the GFR evaluated at the values of the stated variables; and the subscripts 1 and 2 represent surveys 1 and 2 respectively (Das Gupta 1991; Das Gupta 1993).

At survey 2:

$$\mathrm{Q}(C_{i2}) = \frac{\mathrm{GFR}(C_{i2,}p_{m2,}\, f_{m2}, f_{s2}) + \mathrm{GFR}(C_{i2,}p_{m1,}\, f_{m1}, f_{s1})}{4}$$

$$+\frac{\mathrm{GFR}\left(C_{i2,}p_{m2,}\,f_{m2},f_{s1}\right)+\mathrm{GFR}\left(C_{i2,}p_{m2,}\,f_{m1},f_{s2}\right)+\mathrm{GFR}\left(C_{i2,}p_{m1,}\,f_{m2},f_{s2}\right)}{12}$$

$$+\frac{\mathrm{GFR}\left(C_{i2,}p_{m1,}\,f_{m1},f_{s2}\right)+\mathrm{GFR}\left(C_{i2,}p_{m1,}\,f_{m2},f_{s1}\right)+\mathrm{GFR}\left(C_{i2,}p_{m2,}\,f_{m1},f_{s1}\right)}{12}$$

The effect of age-distribution on fertility changes between surveys 1 and 2 is the difference between the standardized rates: $\mathrm{Q}(C_{i2})-\mathrm{Q}(C_{i1})$. I then repeat this process for the other four components. The different effects should sum up to the difference between GFR_2 and GFR_1. It should, however, be noted that these 'effects' are not causal.

I calculated births and exposures following the directions laid out in the Guide to DHS Statistics (Rustein and Rojas 2006). What I term 'marriage rates' in this study are ratios of the exposure of married women to that of all women aged 15 to 44. To obtain marital fertility rates, I divided births occurring to married women by the exposure of married women at that age. Similarly, nonmarital fertility is the ratio of births at that age occurring to nonmarried women to the corresponding exposure for nonmarried women.

1.3.3 Components of marital and nonmarital fertility

I expanded the decomposition of fertility trends by incorporating the different categories of marriage and non-marriage. In a simplistic categorization, married women can either be in monogamous or polygamous marriages; and nonmarried women can either have never married, be cohabiting, or they can be divorced (or separated or not living together), or widowed. The GFR can therefore be further expressed as a function of all these different constituents of marital and nonmarital fertility:

$$GFR=\frac{\begin{array}{r}polygynous\ births+monogamous\ births+cohabitation\ births\\+\,divorce\ births+widow\ births+births\ to\ never\ married\ women\end{array}}{total\ exposure}$$

$$= \frac{\begin{array}{c}(polygynous\ exposure \times polygynous\ marital\ fertility\ rate)\\ + (monogamous\ exposure \times monogamous\ marital\ fertility\ rate)\\ +(cohabitation\ exposure \times cohabitation\ fertility\ rate)\\ + (divorce\ exposure \times divorce\ fertility\ rate)\\ + (widow\ exposure \times widow\ fertility\ rate)\\ + (never\ married\ exposure \times never\ married\ women's\ fertility\ rate)\end{array}}{total\ exposure}$$

$$= \frac{\begin{array}{c}(total\ exposure\ \times marriage\ rate \times polygyny\ rate \times marital\ fertility\ rate)\\ +(total\ exposure\ \times marriage\ rate \times (1 - polygyny\ rate) \times marital\ fertility\ rate)\\ +(total\ exposure \times crude\ cohabitation\ rate \times cohabitation\ fertility\ rate)\\ + (total\ exposure \times crude\ divorced\ rate \times divorce\ fertility\ rate)\\ + (total\ exposure\ \times crude\ widowhood\ rate \times widow\ fertility\ rate)\\ + (total\ exposure \times\ crude\ never\ married\ rate \times never\ married\ women's\ fertility\ rate)\end{array}}{total\ exposure}$$

Summing over all ages, *i*,

$$\boldsymbol{GFR} = \sum_{\boldsymbol{i=15}}^{\boldsymbol{44}} \boldsymbol{C_i}\left[\boldsymbol{p_{mi}}(\boldsymbol{p_{pm_i}} \times \boldsymbol{f_{pm_i}}) + \left((\boldsymbol{p_{m_i}} - \boldsymbol{p_{pm_i}}) \times \boldsymbol{f_{mm_i}}\right) + (\boldsymbol{p_{d_i}} \times \boldsymbol{f_{d_i}}) + (\boldsymbol{p_{w_i}} \times \boldsymbol{f_{w_i}}) + (\boldsymbol{p_{c_i}} \times \boldsymbol{f_{c_i}}) + (\boldsymbol{p_{nm_i}} \times \boldsymbol{f_{nm_i}})\right]$$

Using Das Gupta's method, the change in GFR is then

$$GFR_2 - GFR_1 = C_i\text{effect} + p_m\text{effect} + p_{pm}\text{ effect} + f_{pm}\text{ effect} + f_{mm}\text{ effect} + p_d\text{ effect} + f_d\text{effect} + p_w\text{ effect} + f_w\text{ effect} + p_c\text{ effect} + f_c\text{ effect} + p_{nm}\text{ effect} + f_{nm}\text{ effect}$$

where f_{pm} is the fertility rate for polygynously married women; the corresponding fertility rate for monogamously married women is f_{mm}; p_{pm} is the rate of polygamy. By definition, the rate of monogamous marriage is $p_m - p_{pm}$. f_c is cohabiting women's fertility rate; p_c is the rate of cohabitation; f_w is the fertility rate for widows; and p_w is the rate of widowhood, the fertility rate and nonmarriage rate for women who have never married are f_{nm} and p_{nm}, respectively. Such an extension of the decomposition allows us to understand where the changes in marital and nonmarital fertility and marriage rates derive from.

As before, all the different relationship rates were calculated as the ratio of the exposure to women in that status to that of all women aged 15 to 44. These rates – marriage, cohabitation, nonmarriage, widowhood, and divorce rates - are therefore crude rates. The exception is the rate of polygyny, which I calculated as the proportion of polygynous exposure to marital exposure.

1.3.4 Fertility changes at each age

Fertility in most populations varies by age. I therefore allocated overall fertility changes to changes at each age, and then decomposed these changes in fertility into the contributions of their components. The overall effect on change for each of the component is a sum of effects across all ages. This turn out to be more apparent when we appreciate that the GFR is the sum of age-specific GFRs:

$$GFR = \sum_{i=15}^{44} GFR_i = \sum_{i=15}^{44} C_i(p_{mi} \times f_{mi} + (1 - p_{mi}) \times f_{si})$$

The change in the GFR at each age is

$$ASGFR_2 - ASGFR_1 = C \text{ effect} + p \text{ effect} + f_s \text{effect} + f_m \text{ effect}$$

And, by expansion,

$$ASGFR_2 - ASGFR_1 = C \text{ effect} + p_m \text{effect} + p_{pm} \text{ effect} + f_{pm} \text{ effect} + f_{mm} \text{ effect} + p_d \text{ effect} + f_d \text{effect} + p_w \text{ effect} + f_w \text{ effect} + p_c \text{ effect} + f_c \text{ effect} + p_{nm} \text{ effect} + f_{nm} \text{ effect}$$

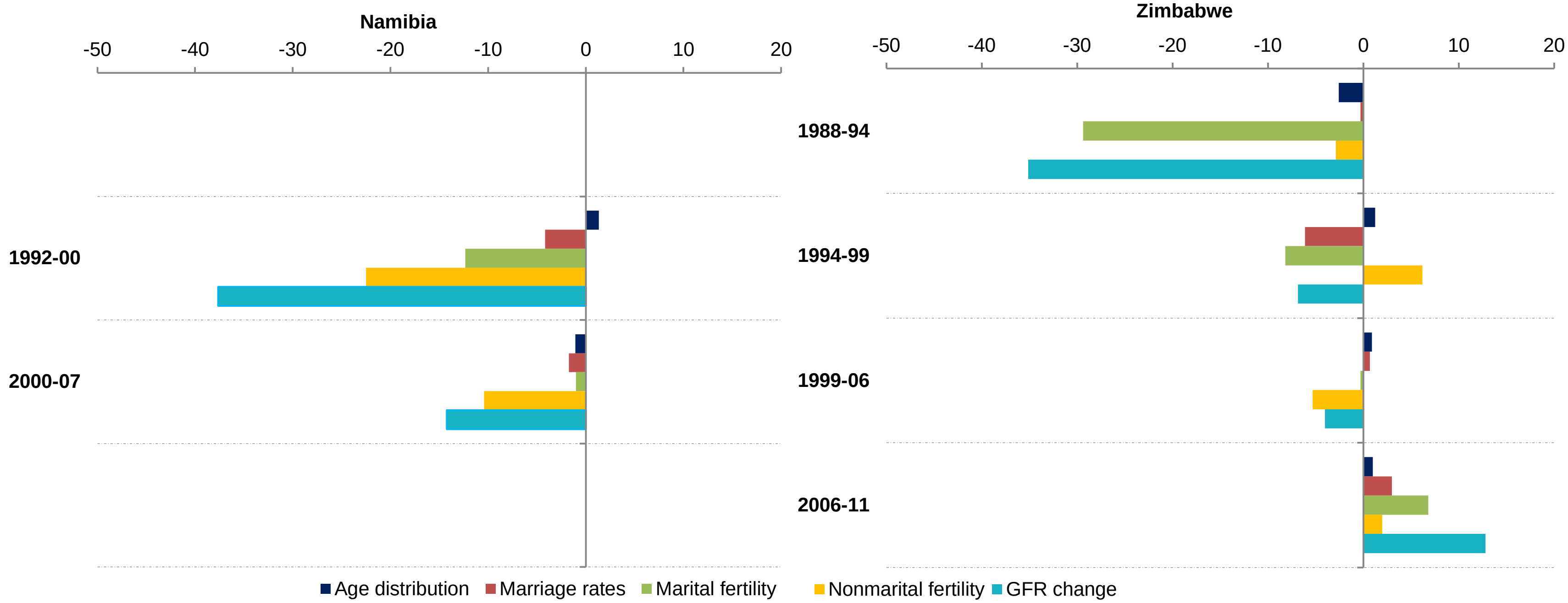
This decomposition thus allows us to examine closely the distribution of effects by age.

1.4 Results

In this section I present the results of the three decompositions. I present results separately for each pair of countries, in order to focus attention on countries with similar fertility transitions. For each pair, I first present the results of the national-level decomposition, before presenting age-specific results for the four-factor and then extended decompositions. I omitted widow and divorce effects (both fertility rate and marriage rate effects) because they were small in almost all countries. I also did not show the age-specific effects of age distribution but I discuss these results and show the effects at each age in Appendix 9.

1.4.1 Namibia and Zimbabwe

Figure 1-5: Contributions of the components of fertility to fertility changes in Namibia and Zimbabwe



<u>Notes:</u>
Namibia: GFRs:- 1992: 176; 2000: 138: 2007: 122 births per 1000 women.
Δ GFR:- 1992-00: -38; 2000-07: -16 births per 1000 women.

Zimbabwe: GFRs: 1988: 185; 1994: 148; 1999: 141; 2006: 137; 2011: 150 births per 1000 women.
Δ GFR:- 1988-94: -37; 1994-99: -7; 1999-06: -4; 2006-11: +13 births per 1000 women.

Overall changes:

Figure 1-5 shows the decomposition of overall fertility in Namibia and Zimbabwe. In Namibia, fertility declined in both inter-survey periods, and throught, this decline was primarily accounted for by declining nonmarital fertility. The relative contribution of declining marital fertility diminished over time – the effect of marital fertility was about 60 per cent that of nonmarital fertility in the first period, and by the second period it was less than a quarter. Neither changes in the age distribution nor declining marriage rates accounted for a considerable portion of change in either period.

In Zimbabwe, fertility declined in the first three periods before increasing in the last. The magnitude of fertility decline tapered off before the reversal in direction. In the first two time periods, the largest contributors to declining fertility were declining rates of marital fertility. The relative importance of declining marriage rates and increasing nonmarital fertility were, however, more pronounced in the second than first period. In the third period, the one immediately prior to the reversal of fertility decline, declining nonmarital fertility rates accounted for the largest portion of the fertility decline, and the effect of marital fertility was negligible. Interestingly, when fertility increased in the final period, the largest contributor was, once more, increasing marital fertility. Changes in all factors in this period did, however, increase fertility. Fertility, whether trending upwards or downwards in Zimbabwe, has been mainly affected by changing fertility of married women.

Age-specific changes:

Figure 1-6 shows fertility changes at each age, and the effects of changes in each factor, and Figure 1-7 shows the results of the further decomposition in Namibia. Over the entire period of observation, fertility changes among 15 to 19 year olds in Namibia were mainly due to changing marriage rates. At other ages, there was a shift in the impact of factors on fertility trends. In earlier periods, the main effect for women under 30 years of age was declining fertility of never married women, although monogamous marital fertility changes also had substantial effects. Above age

30, the main effect was declining monogamous marital fertility. By the latter periods, fertility mainly declined due to declining fertility of never married women. The decline in marriage in the first period mainly depressed 20 to 30 year old fertility, and increasing cohabitation and abstention from marriage increased fertility at these ages. Thus, while overall effect of changing marriage rates was low, it was not insignificant among younger women, particularly in the earlier, periods.

Figure 1-8 shows that in Zimbabwe, in all four periods, the majority of fertility change at each age was explained by changes in fertility rates of married women. Where we can distinguish polygynously married from monogamously married women (Figure 1-9), the changes in fertility among women were largely a function of changes in the fertility of monogamously married women. The exceptions were the 15-19 year olds, whose fertility changes were almost equally explained by changes. At all ages and throughout the entire period, the effects of changing marriage rates and changing nonmarital fertility were relatively small.

Figure 1-6: Effects of change in components on age-specific fertility changes in Namibia

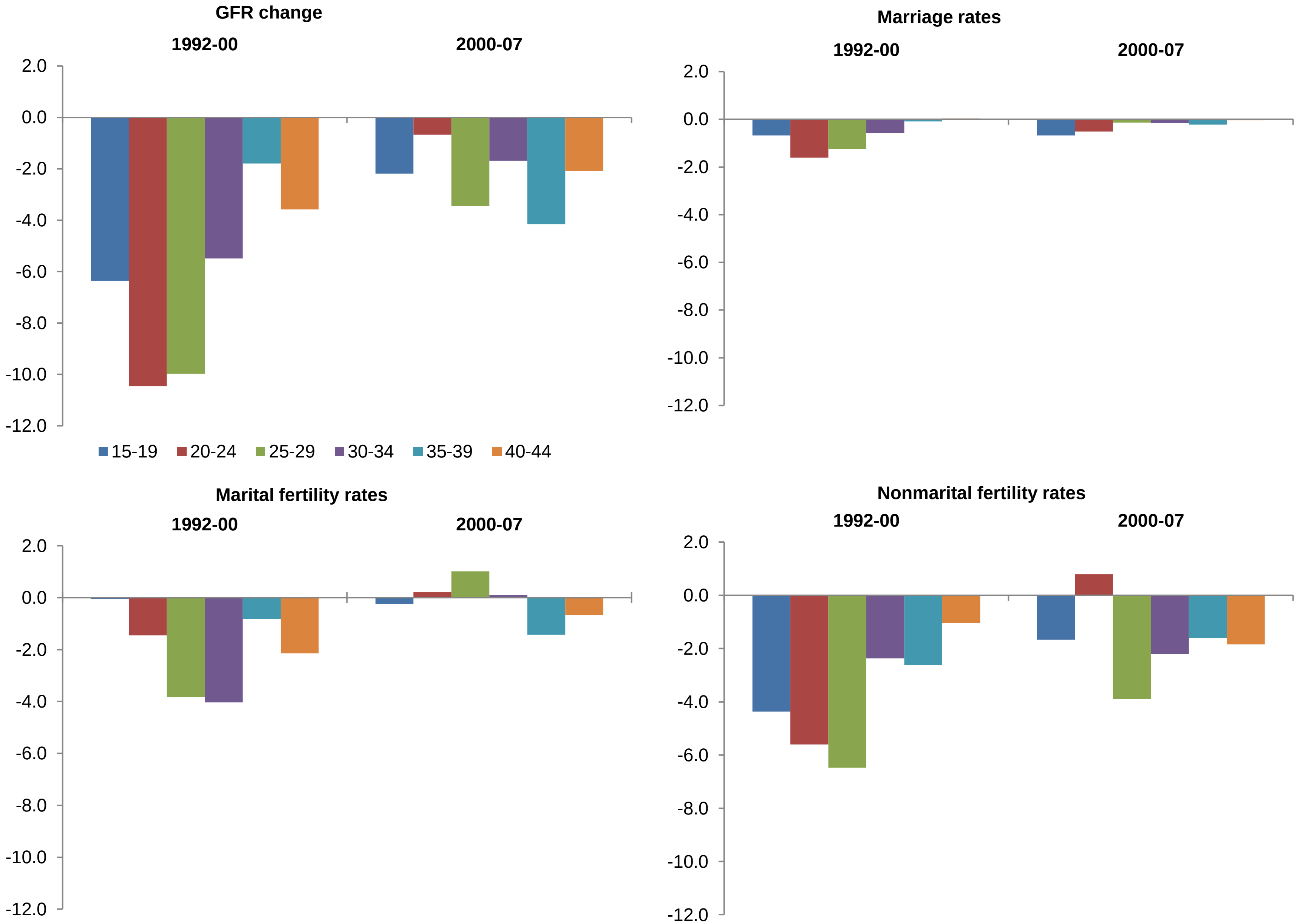


Figure 1-7: Further decomposition - Effects of change in components on age-specific changes in Namibia

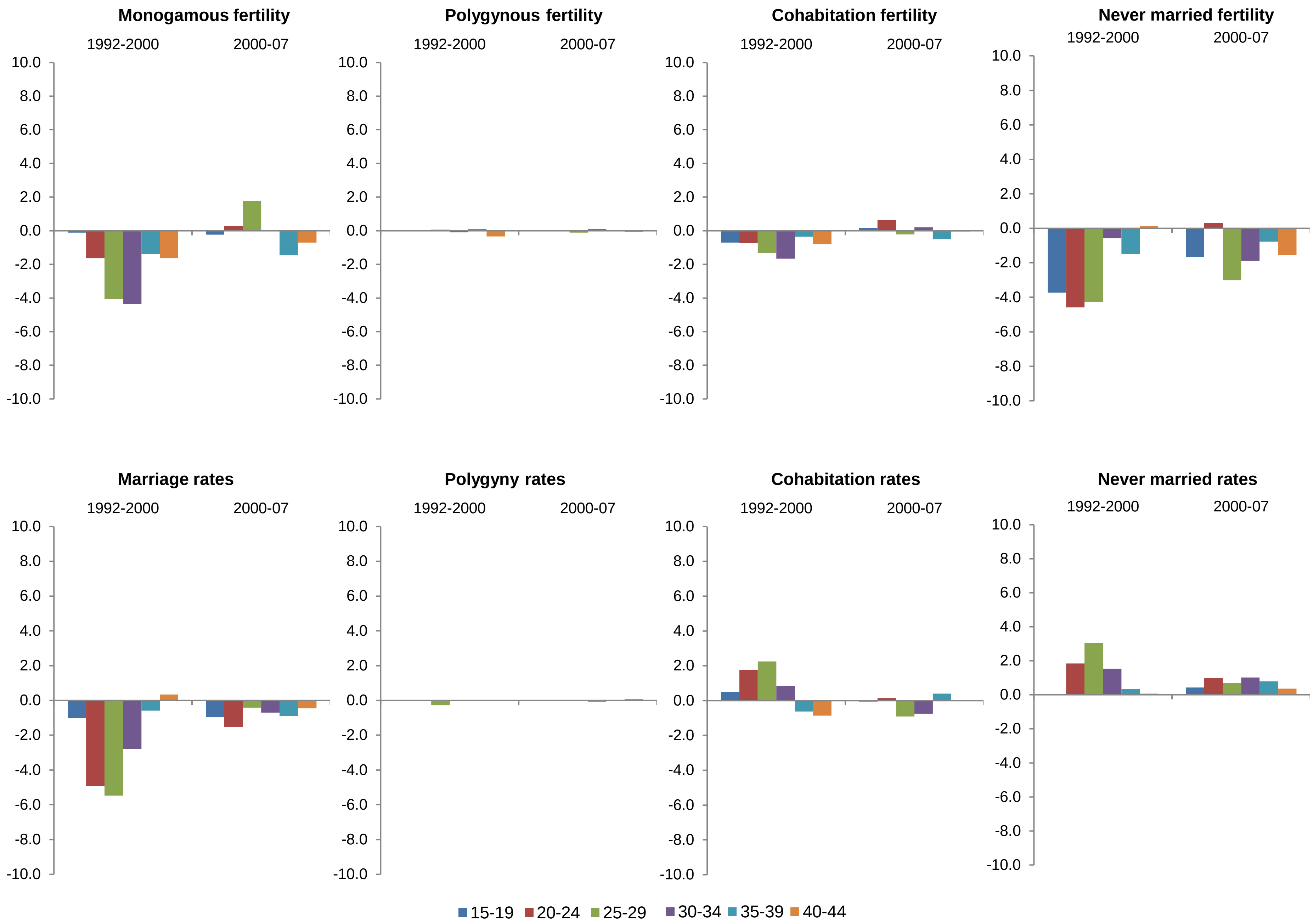


Figure 1-8: Effects of change in components on age-specific fertility changes in Zimbabwe

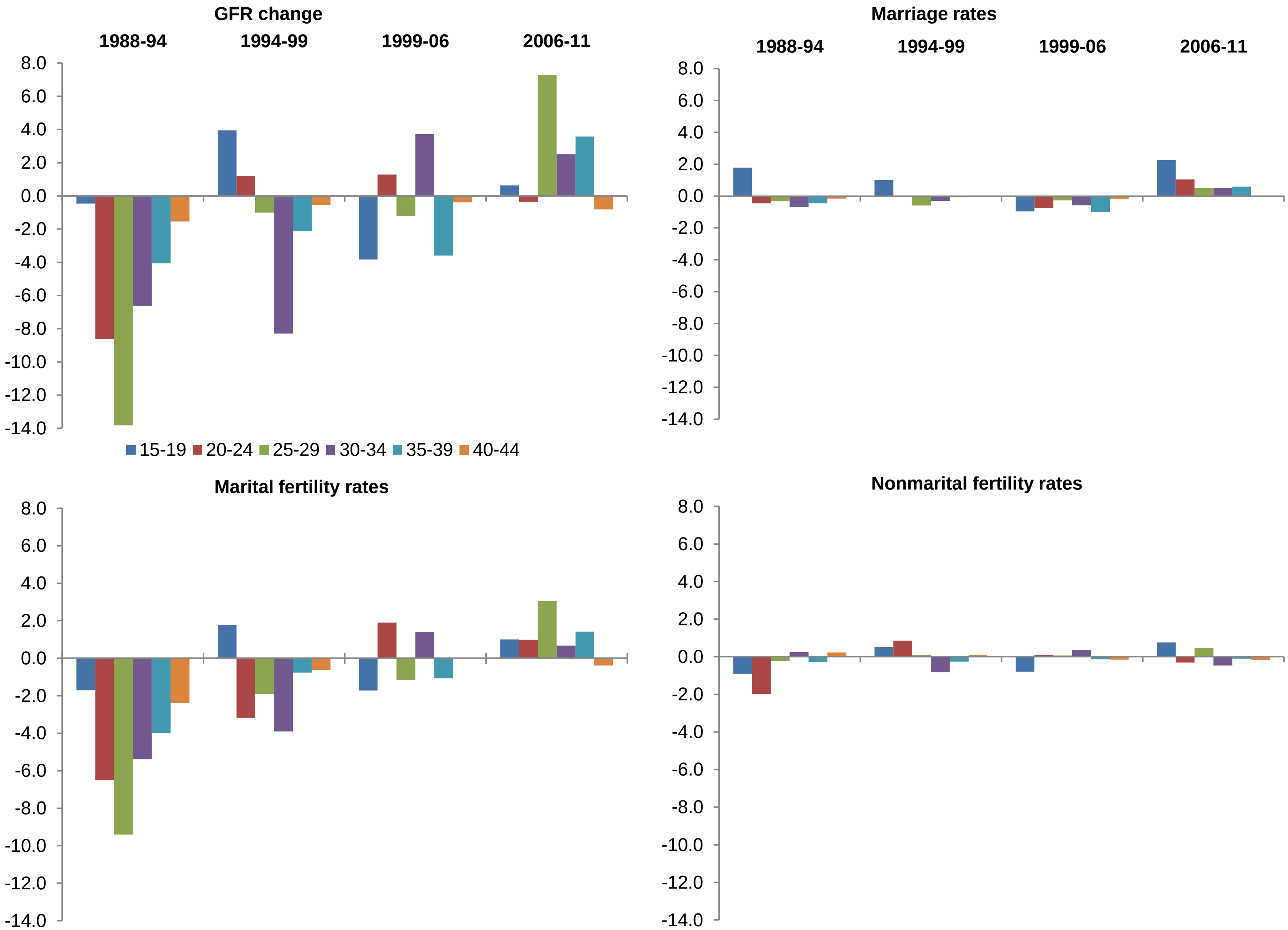
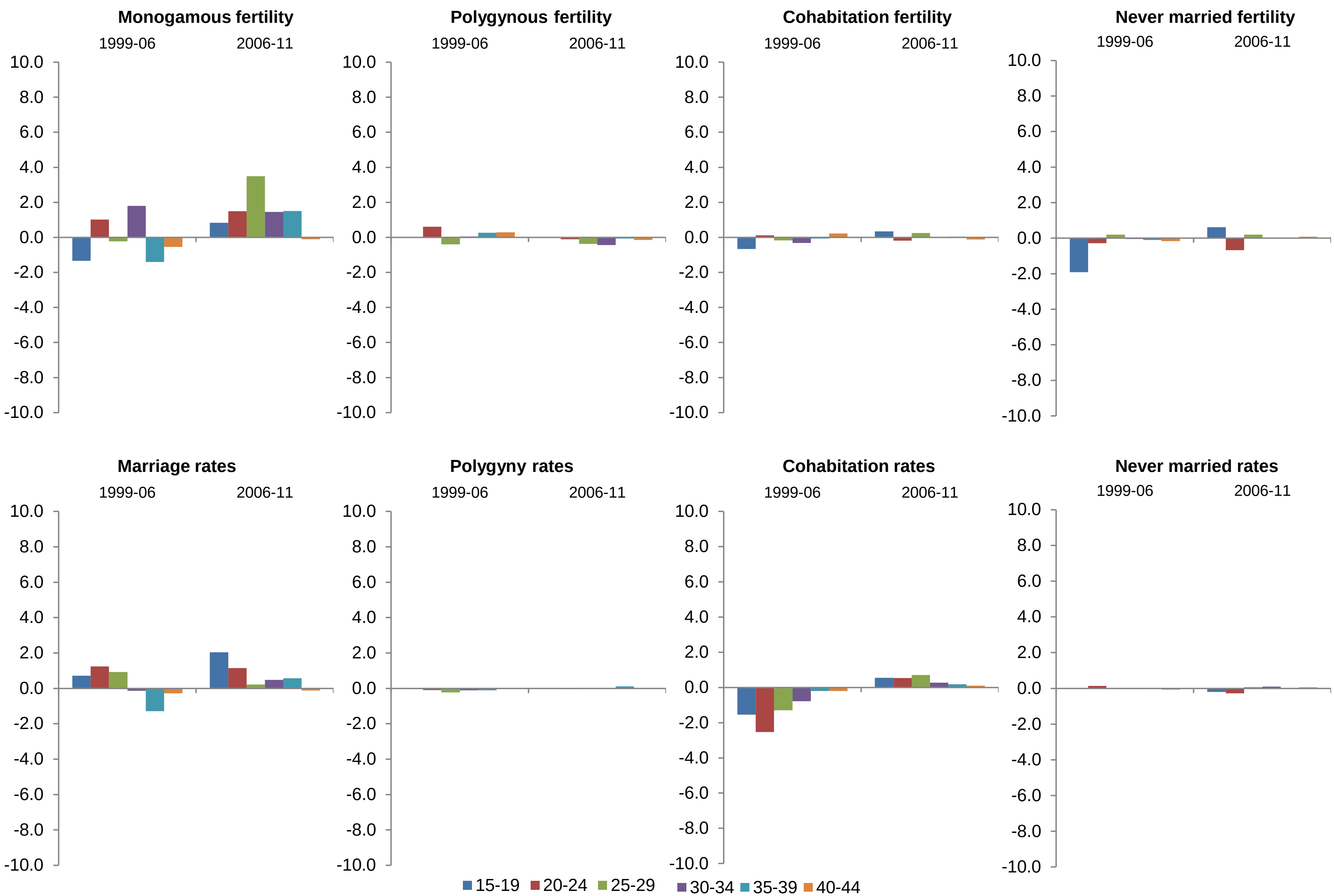
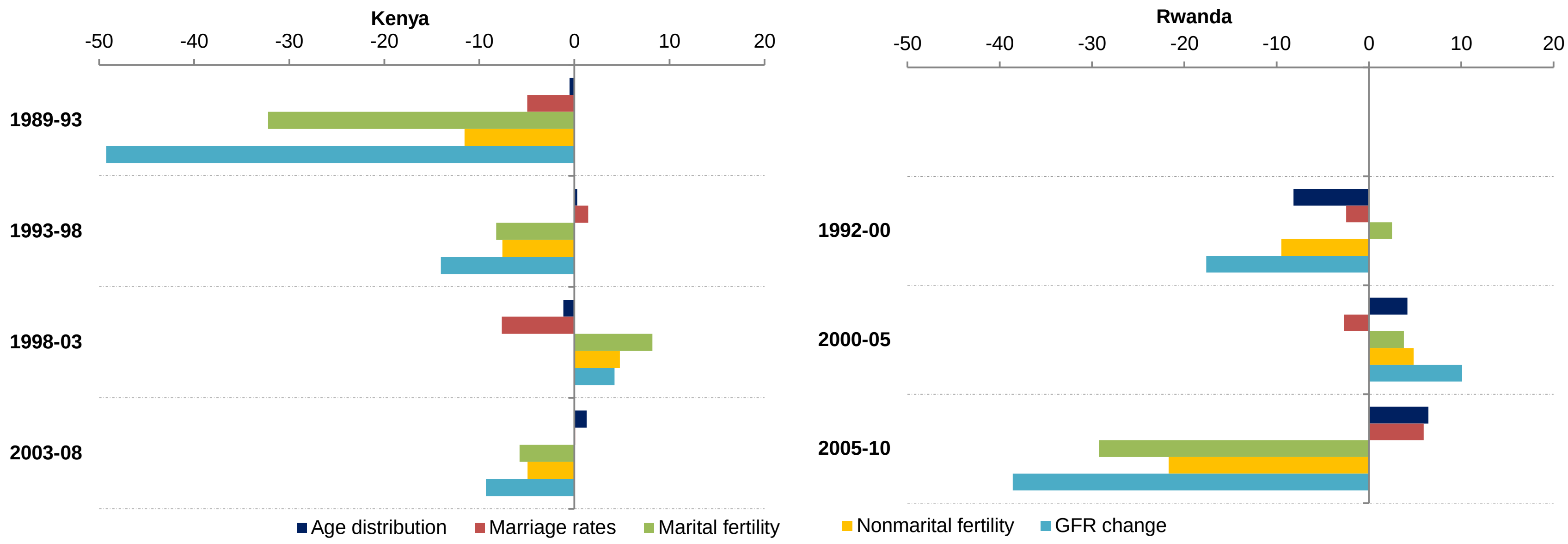


Figure 1-9: Further decomposition - Effects of change in components on age-specific changes in Zimbabwe



1.4.2 Kenya and Rwanda

Figure 1-10: Contributions of the components of fertility to fertility changes in Kenya and Rwanda



<u>Notes:</u>

Kenya: GFRs:- 1989: 230; 1993: 182; 1998: 166; 2003: 171; 2008: 161 births per 1000 women.
Δ GFR:- 1989-93 -48; 1993-98: -16; 1998-03: +5; 2003-08: -10 births per 1000 women.

Rwanda: GFRs: 1992: 197; 2000: 180; 2005: 190; 2010: 151 births per 1000 women.
Δ GFR:- 1992-00: -17; 2000-05: +10; 2005-10: -39 births per 1000 women.

Overall changes:

The decomposition of GFR changes in Kenya and Rwanda is shown in Figure 1-10. Kenya experienced fertility decline in the first two periods, an increase in the third, before fertility declined again. The fertility decline in the first two periods was mainly explained by declining marital fertility. The effect of declining nonmarital fertility relative to that of declining marital fertility increased over time – in the first period, the effect of nonmarital fertility was about half that of marital fertility, and by the second period, the effect of nonmarital fertility was approximately ninety percent that of marital fertility. Declining marriage rates and changing age distribution had much smaller effects. In the period of fertility increase, the largest contribution was from increasing marital fertility. Increasing nonmarital fertility also pushed fertility upwards but by a smaller amount. Declining marriage rates had a depressing effect on fertility which was only slightly less than the effect of marital fertility. In the final period where fertility reversed course, both declining marital and nonmarital fertility pushed fertility downwards. Declining marital fertility, however, affected fertility change to a greater extent. Fertility changes in Kenya were therefore primarily affected by changes in the quantum of marital fertility, whether fertility was increasing or decreasing. The second largest effects in almost all periods were changes in the quantum of nonmarital fertility.

Rwanda experienced a fertility decline in the first period, an increase in the second, and a decline in the final period. In the first period, the majority of the decline was due to falling nonmarital fertility. The change in age distribution had a slightly smaller and depressing effect. Falling marriage rates and increasing marital fertility only had marginal effects on fertility. In the middle period, the fertility increase was largely explained by increasing nonmarital fertility. Increasing marital fertility also increased fertility, but by a smaller amount. We also see an almost equal effect of changing age distribution to that of marital and nonmarital fertility changes. By the third and final period, the majority of the fertility decline in Rwanda was primarily effected by declining marital fertility. Declining nonmarital fertility also significantly contributed to the fertility decline, but its effect was now only about two thirds that of declining marital fertility. Effects of increasing marriage rates and changing age distribution were much smaller in this period. Rwanda has therefore, over the entire period, experienced a shift in importance of factors from nonmarital to marital fertility rates.

Age-specific changes:

Figures 1-11 and 1-12 show the age-specific decompositions of fertility changes in Kenya. For 15 to 19 year olds, the main effects throughout the entire period were changing marriage rates and nonmarital fertility. The (larger) effects of nonmarital fertility primarily come from changing never married women's fertility. At ages 20 and above, the fertility decline in the first period was mainly due to declining monogamous marital fertility. In Kenya, the effect of change in polygynously married women's fertility was not as miniscule as in Namibia and Zimbabwe. After the first period, the effects of changing marriage rates and nonmarital fertility relative to that of changing marital fertility began to increase. In the second period, the decline in fertility among women aged below 25 was mainly accounted for by declining nonmarital fertility. Figure 1-12 shows that among 20 to 24 year olds, this was mainly an effect of the decline in fertility of cohabitors. For most women aged 30 and above, the main effect was declining monogamous marital fertility. In the third period, at all ages greater than 19, the effect of the increase in monogamous marital fertility surpassed all other changes and explained the majority of the change. In the final period, for women aged 20-34, the main effect was declining marital fertility of monogamous women. The remaining age groups had less consistent patterns of change.

The decomposition of age-specific fertility changes in Rwanda is shown in Figures 1-13 and 1-14. Changing marriage rates and fertility of married and nonmarried women appear to have had equal contribution to changing fertility of 15 to 19 year olds over the entire period of observation. At the other ages, there was an increase in the effects of changes in both monogamous marital and in nonmarital fertility over time. The nonmarital fertility effect is mainly from changes in fertility of cohabiting women, which is largest among 20 to 29 year old women. Effects of changing monogamous marital fertility are primarily concentrated among 25 to 39 year olds, particularly by the end period. There is no clear trend by age in the effects of changing rates of entering into marriage. Changes in rates of cohabitation appear to have almost equal effects at most of the middle ages in the first two periods, but by the end, this effect is concentrated between ages 20 and 34. The increase in fertility of 25 to 29 year olds was explained by increasing fertility of cohabiting women. Increasing cohabitation fertility also significantly increased fertility of 20 to 24 year olds. In the final period, there was not much fertility change among 15-19 year olds. The fertility decline for 20-24 year olds was largely explained by declining cohabitation fertility. For ages 25+, the main effect was declining marital fertility, even though the effect of declining cohabitation fertility was not insignificant.

Figure 1-11: Effects of change in components on age-specific fertility changes in Kenya

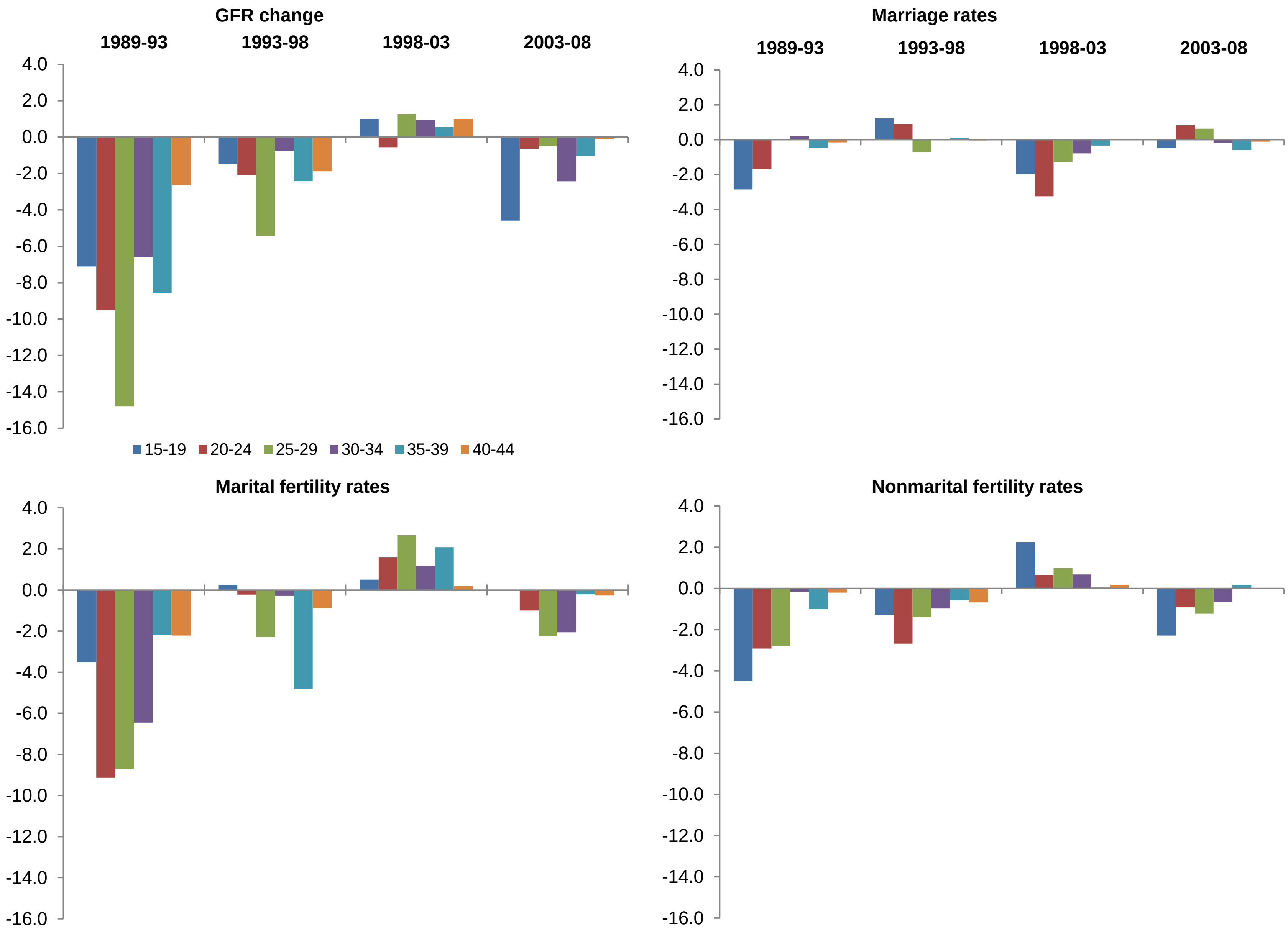


Figure 1-12: Further decomposition - Effects of change in components on age-specific changes in Kenya

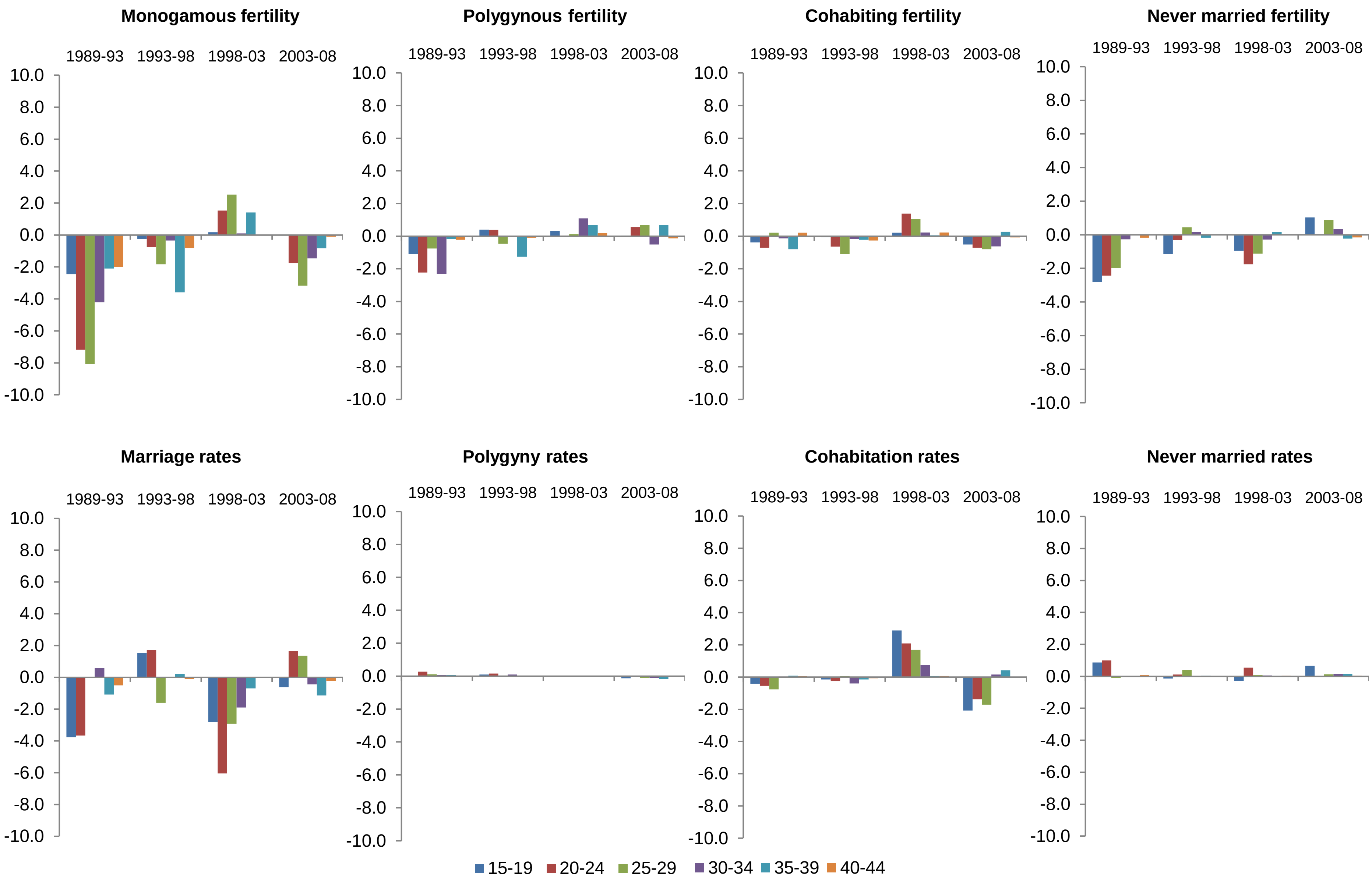


Figure 1-13: Effects of change in components on age-specific fertility changes in Rwanda

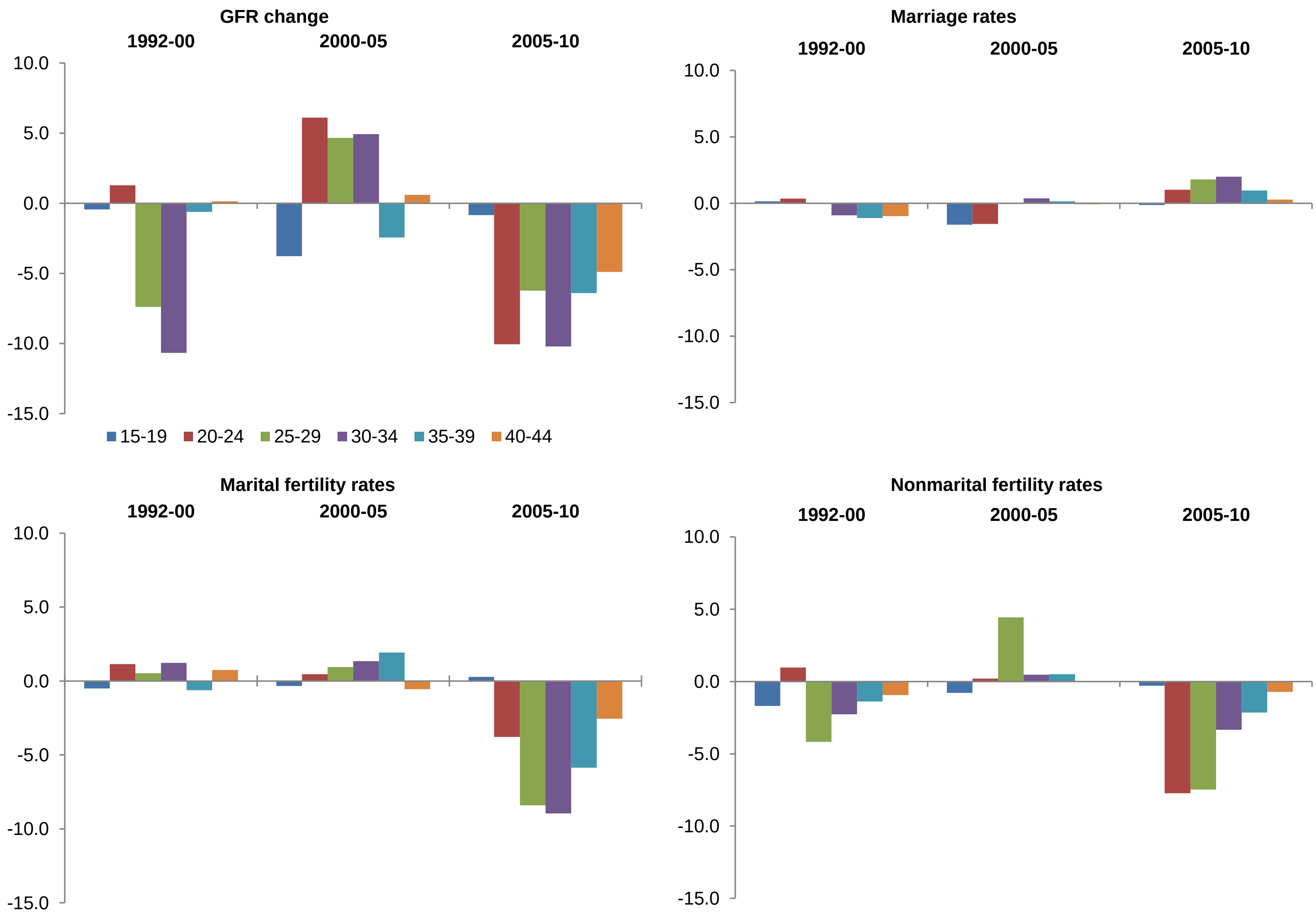
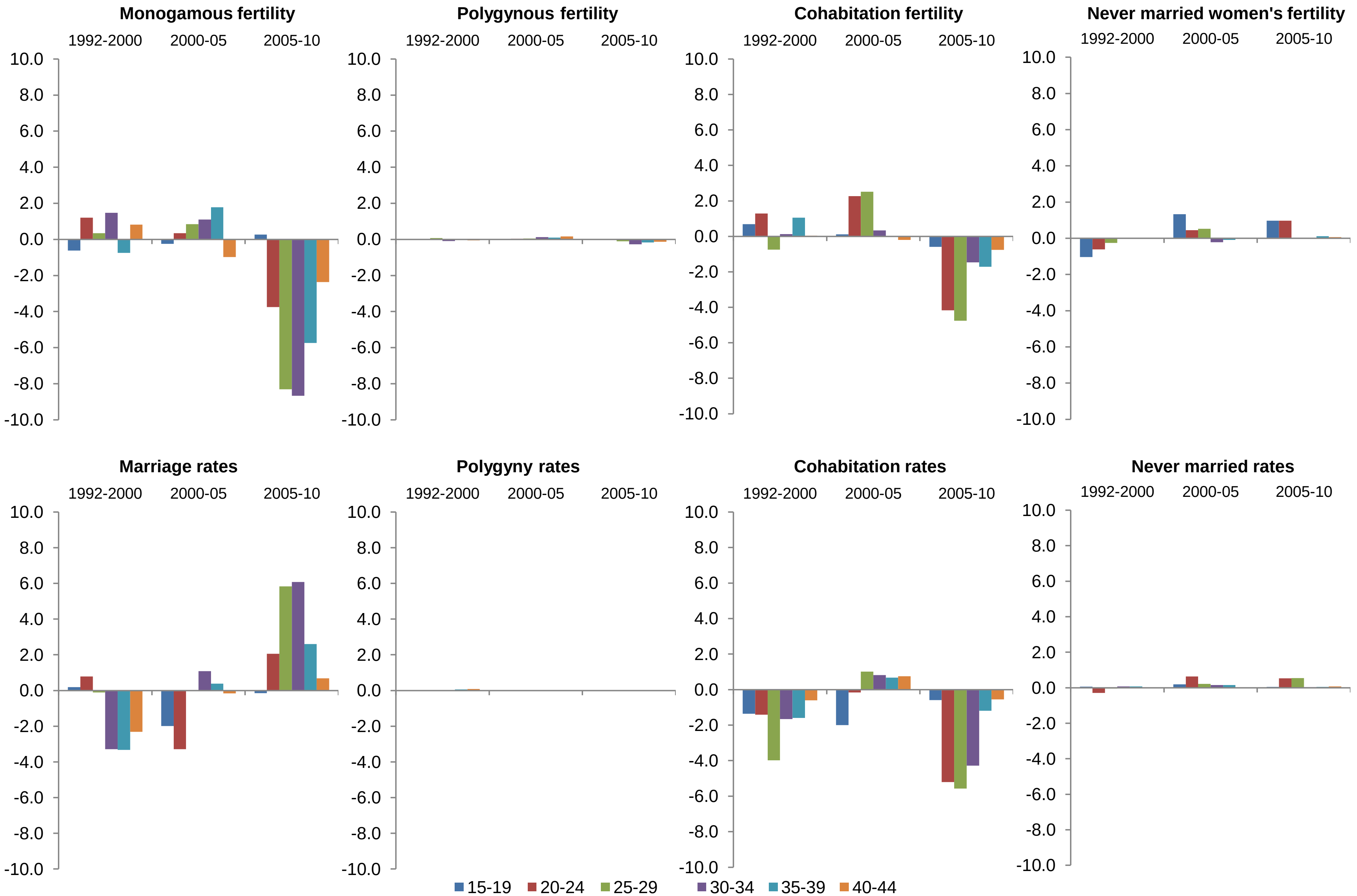
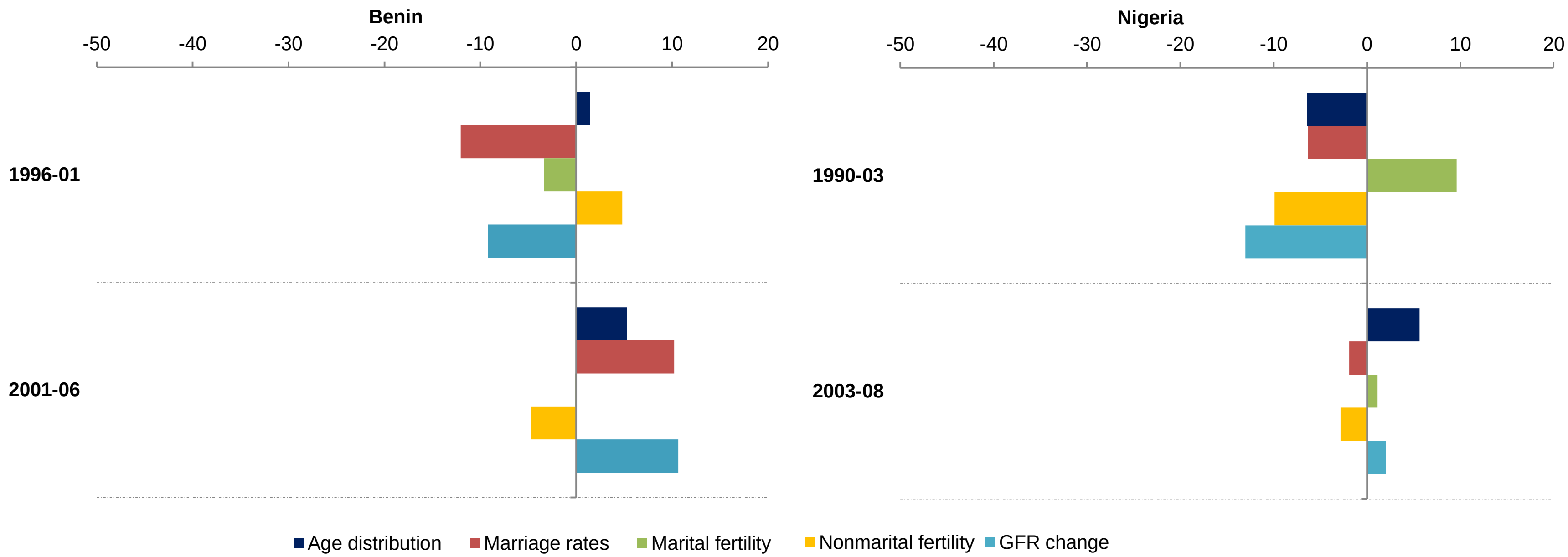


Figure 1-14: Further decomposition - Effects of change in components on age-specific changes in Rwanda



1.4.3 Benin and Nigeria

Figure 1-15: Contributions of the components of fertility to fertility changes in Benin and Nigeria



<u>Notes:</u>

Benin: GFRs:- 1996: 202; 2001: 193: 2006: 204 births per 1000 women.
Δ GFR:- 1996-01: -9; 2001-06: +11 births per 1000 women.

Nigeria: GFRs:- 1990: 207; 2003: 192; 2008: 195 births per 1000 women.
Δ GFR:- 1990-03: -15; 2003-08: +3 births per 1000 women.

Overall changes:

Results for the decomposition of aggregate fertility in Benin and Nigeria are presented in Figure 1-15. In Benin, fertility declined in the first period, and the largest contribution to fertility decline was declining marriage rates between the two surveys. Fertility increased in the second period, and the largest contribution to increasing fertility was increasing marriage rates. Changes in the other three factors affected fertility changes, but to a lesser extent than changing marriage rates. Whether fertility was increasing or decreasing in Benin, it appears that it was mainly affected by changes in marriage rates.

As in Benin, fertility in Nigeria declined in the first period and then increased in the second period, even though the fertility increase in Nigeria was very small. The largest contributors to the first period decline were the decline in nonmarital fertility and the increase in marital fertility which offset each other. Changes in the age distribution and declining marriage rates had a smaller depressing effect on fertility. In the second period, the major contributor to fertility was changing age distribution which increased fertility. The other factors had much smaller effects. In comparison with Namibia, Zimbabwe, Kenya and Rwanda, the effect of changing marriage rates compared with the other factors was more pronounced in the Nigerian transition.

Age-specific changes:

The decomposition of age-specific fertility changes in Benin is presented in Figure 1-16 and Figure 1-17. For 15 to 19 year olds, the main effects were changing marriage rates and nonmarital fertility. Effects of changing nonmarital rates at these ages equally encompassed changing cohabitation and never married women's fertility. The majority of fertility changes in Benin occurred to women aged under 30 in both time periods. This change was a residual of the offset between changing nonmarital fertility rates and marriage rates. In the earlier period of fertility decline, declining marriage rates depressed fertility, while increasing nonmarital – primarily cohabiting – fertility rates pushed fertility upwards. When fertility increased later on, marriage rates were increasing, and nonmarital fertility decreased. By comparing Figures 1-16 and 1-17, we see that the overall effect of changing marriage rates at these ages represented the residual of the opposing effects of changing cohabitation and entry-into-monogamous marriage rates.

Figures 1-18 and 1-19 show fertility changes at each age in Nigeria; and the effects of change in the components. Nigeria presents a complex picture of the changes in the effects of the components of fertility. Between the 1990 and 2003 surveys, marriage rate changes – both from cohabitation and entering into marriage – and changing fertility of never married women had significant contributions to fertility changes among 15 to 19 year olds. In the earlier period, fertility decline among 20 to 24 year olds was mainly due to both declining nonmarital (cohabitation) fertility and declining rates of entering into marriage. Cohabitation rate decline also contributed a smaller effect. Increasing monogamous marital fertility affected the fertility of 20 to 39 year old women. Changing nonmarital fertility rates and marriage rates therefore affected the youngest women, whereas changing marriage rates were important for women in the middle ages of childbearing. By the latter period, fertility change was mainly effected by changing age distribution. The other factors had very small effects on fertility change.

Figure 1-16: Effects of change in components on age-specific fertility changes in Benin

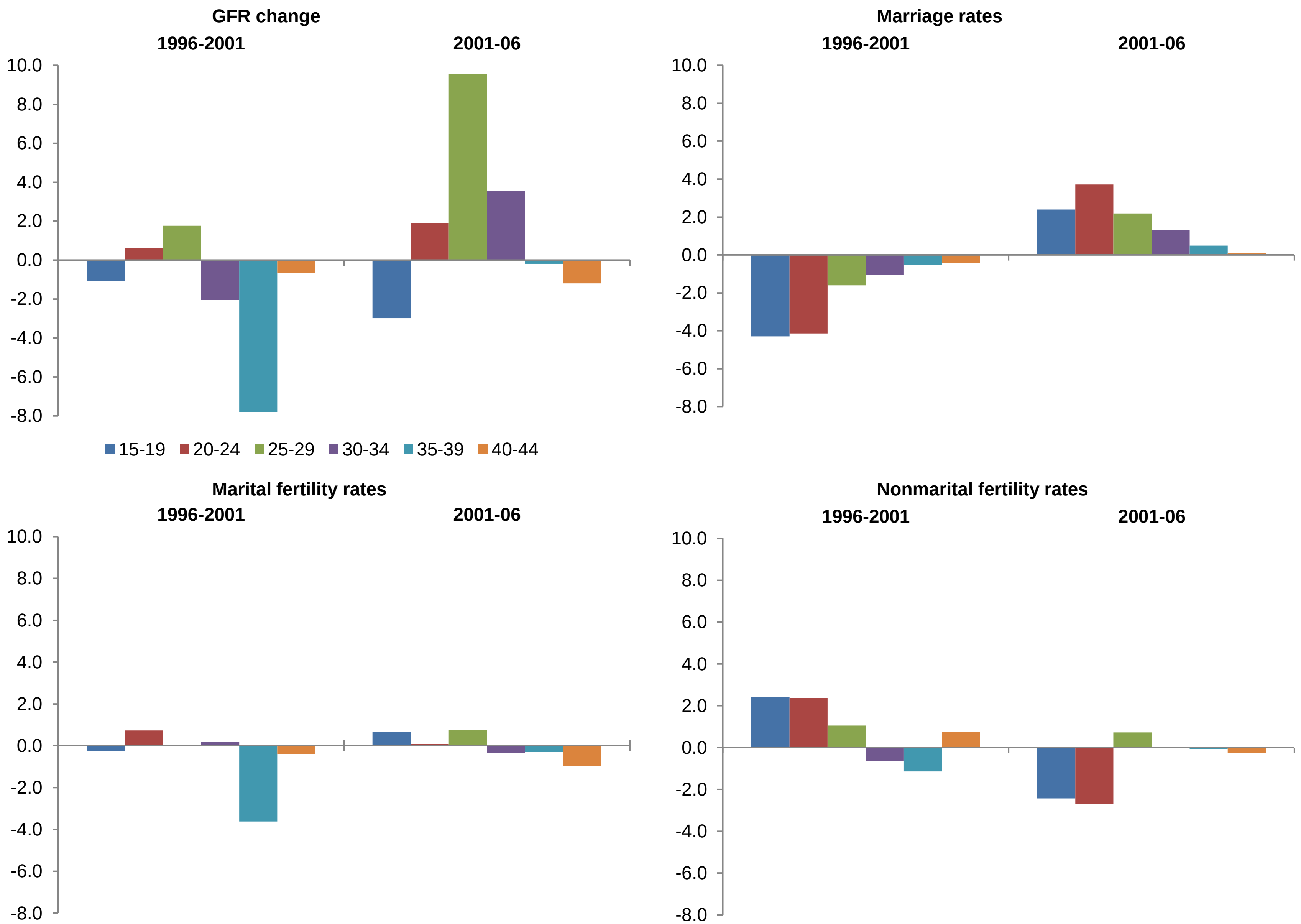


Figure 1-17: Further decomposition - Effects of change in components on age-specific changes in Benin

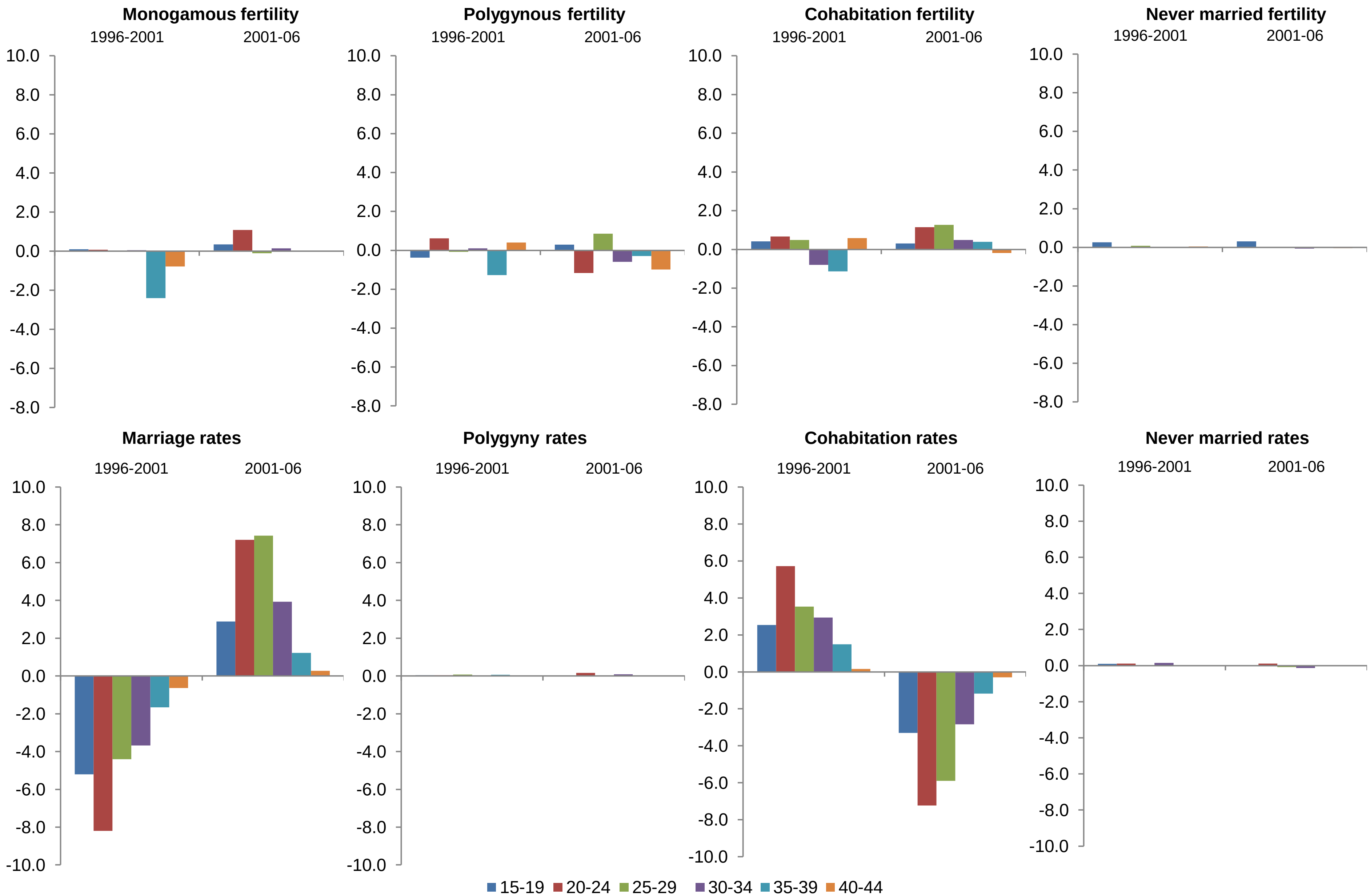


Figure 1-18: Effects of change in components on age-specific fertility changes in Nigeria

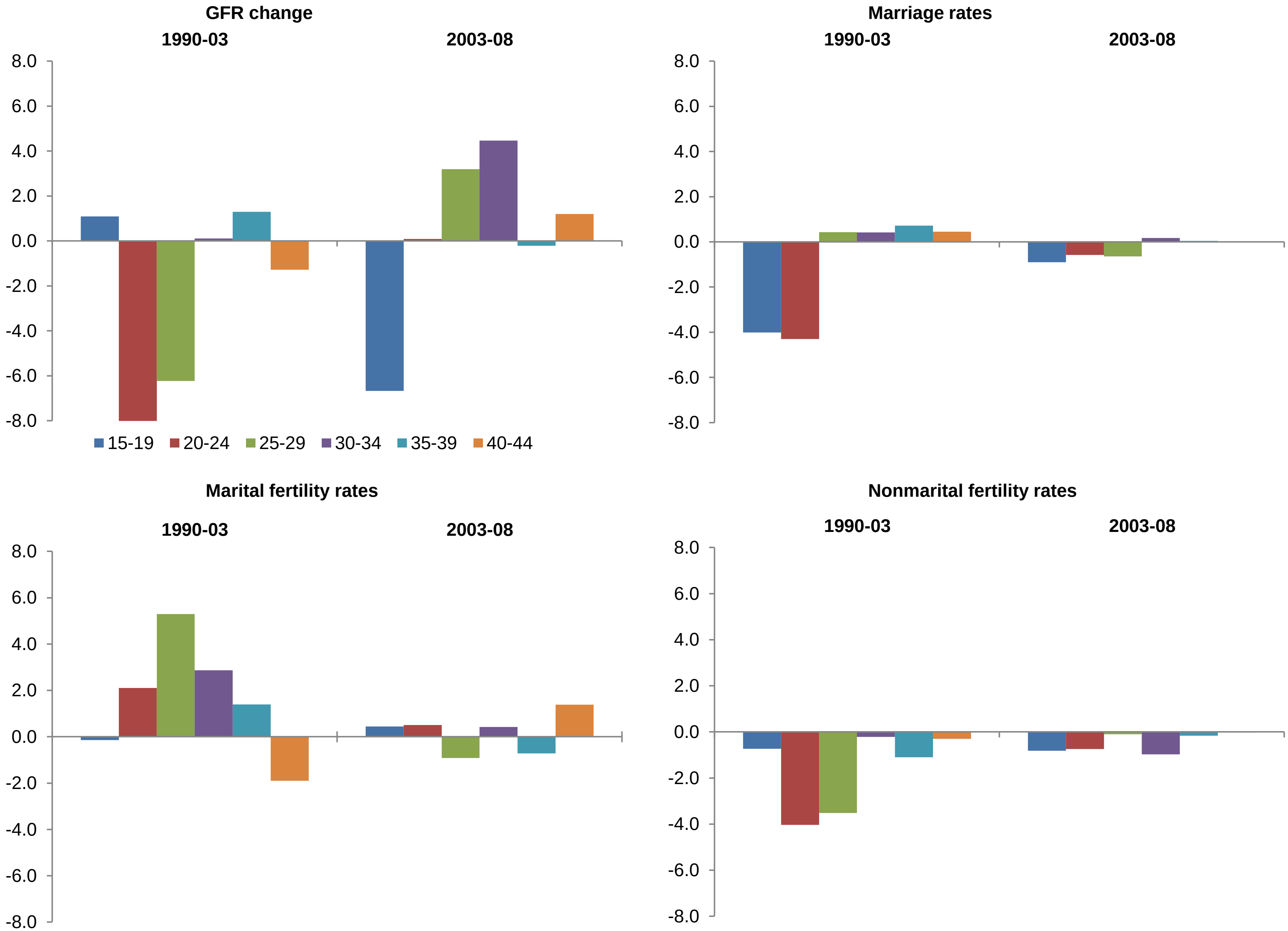
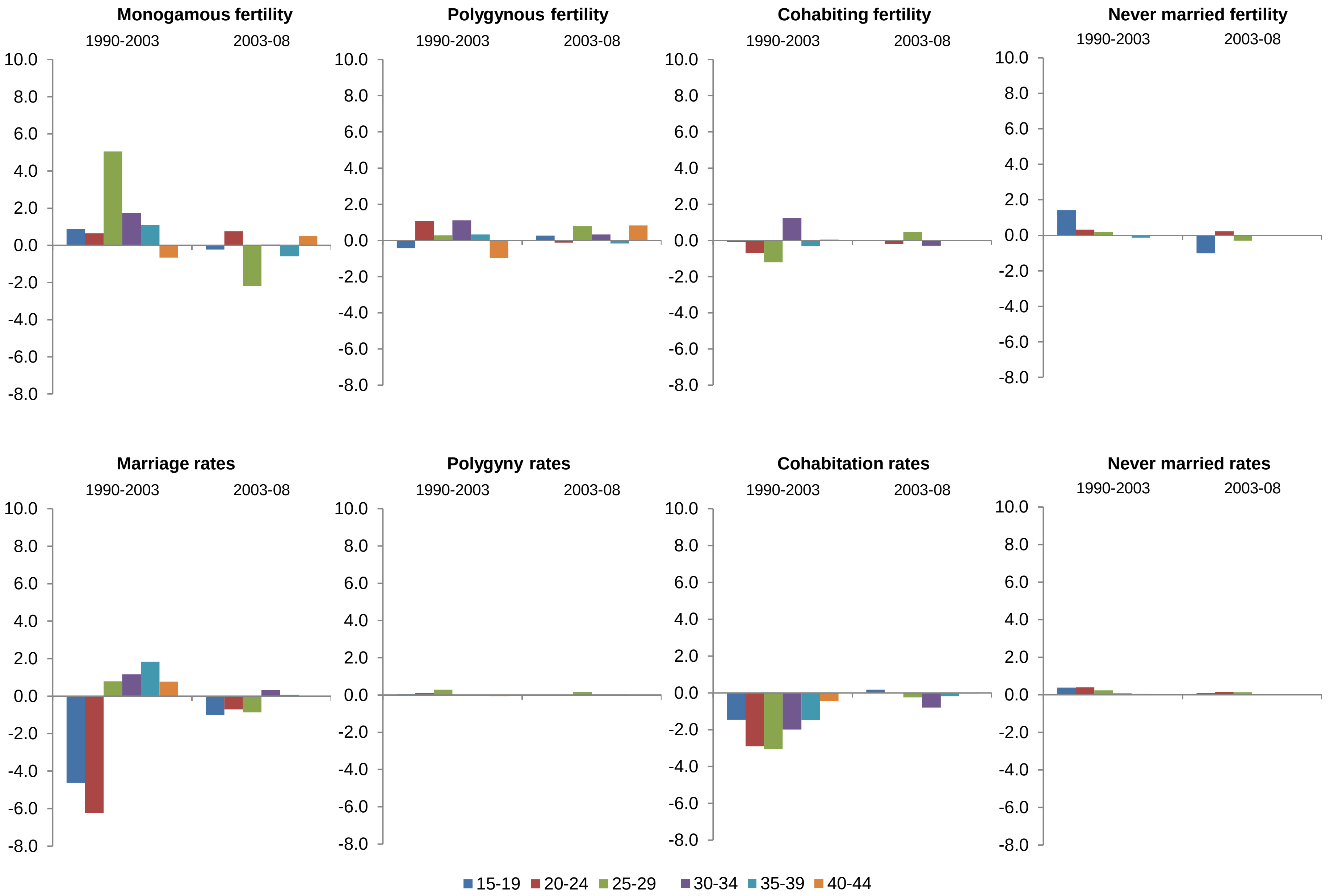


Figure 1-19: Further decomposition - Effects of change in components on age-specific changes in Nigeria



1.4 Discussion of Results

The decomposition of overall fertility changes in six countries in sub-Saharan Africa revealed some definite patterns in five of the six countries that were examined. In Namibia, declining fertility trends were mainly affected by declining fertility of single, never married women. In Zimbabwe, regardless of whether fertility was increasing or decreasing, trends appear to have been mainly steered by changing marital fertility, namely that of monogamous women. In these two countries, changes in marriage patterns did not have a substantial relative effect on overall fertility changes. The leading effect on fertility trends in Kenya was changing monogamous marital fertility, although we observed an increase in the relative effects of changing nonmarital fertility - primarily that of never married women - over time. Rwanda presents a converse picture to Kenya: while the largest effects in earlier periods stemmed from changing nonmarital – cohabitation - fertility rates, in latter periods there was increasing importance of changing monogamous marital fertility. In the final period marital fertility had, in fact, the largest effect on fertility decline in Rwanda. Whereas the relative effects of changing marriage rates in Kenya and Rwanda were a little more marked than in Namibia and Zimbabwe, they were not as pronounced as in Benin and Nigeria. In Benin, changing marriage rates contributed the largest to changing overall fertility, both during the period of decline and of increase in fertility. There was little change in marital and nonmarital fertility, so that they contributed only slightly to fertility trends. Nigeria had less clear patterns of the effects of the change in the components. All the components appeared to have equivalent overall effects on fertility changes, although not always pushing fertility in the same direction. The effect of changing marriage rates relative to the other factors was, however, greater than in the lower fertility countries.

These results seem to confirm the hypothesis that the importance of changing marriage patterns is dependent on the degree of progression of the fertility transition. In our set of countries, those with lower fertility levels had smaller effects of marriage rate changes relative to changes in the quantum of marital and nonmarital fertility. Similarly, those with higher fertility had higher relative effects of changing marriage rates; i.e. the importance of changing marriage rates increased with increasing fertility levels:

they were smallest in Namibia and Zimbabwe, larger in Kenya and Rwanda, and highest in Benin and Nigeria. As suggested by Bongaarts (1987), this is likely dependent on increased intentional control, by women, of their exposure to childbearing as countries depart from natural fertility.

The effects of changes in marital and nonmarital fertility appear to be in the same direction whether fertility is increasing or decreasing. This suggests that the determinants of marital and nonmarital fertility may be similar. Changes in rates of polygyny, divorce, widowhood, and nonmarriage (with the exception of Namibia) had no effects on fertility trends; although increase in cohabitation pushed fertility upwards. Declining entry into marriage depressed fertility. Exposure to sex therefore appears to be higher in marital and cohabiting relationships than for women in other statuses. The similarity in direction of effect between cohabitors and married women may be because these may be the same women – i.e. status may be getting convoluted during the interviewing process. In separate analyses (not presented here), I decomposed fertility into the four components, but pulling cohabitors into the 'married' category. Apart from reassigning effects of changing nonmarital to marital fertility, that analysis mainly increased the prominence of changing marriage rates in four of the six countries (Zimbabwe, Rwanda, Kenya, and Nigeria). Relative effects of changing marriage rates were reduced in Benin. The decomposition in Namibia was not greatly affected. These results imply that data collection context is important for whether results for married and cohabiting women should be taken together.

The effects of the components of fertility were not equal at all ages; nor were they similar in all countries. The question which has mainly been asked concerning changing adolescent fertility is whether increasing age at marriage would lead to lower fertility, or if it would lead to higher levels of premarital fertility (Mensch et al. 2005). In most countries, median age at first marriage went up by a year to two over the past four decades in most countries, and the proportion of women who have never married among 15 to 19 year olds increased. The prior study by Harwood-Lejeune (2001) on changing premarital adolescent fertility found that offsetting effects of changing nonmarriage rates and age-specific levels of premarital fertility in almost all countries studied; all of which produced seemingly stable levels of premarital fertility. Fertility among married adolescents declined because of declining marriage rates. Age-specific marital fertility rates remained constant. In this paper, I find that declining marriage rates in this age group have been important for fertility decline at this age, i.e., increasing age at first marriage pushed adolescent fertility downwards. In Namibia, declining marriage rates had the largest fertility-inhibiting effect for teenage women; in Kenya, Benin and Nigeria, the largest effects were both changing marriage rates and nonmarital fertility; while in Zimbabwe and Rwanda all factors were equally important. These results suggest that declining marriage rates for 15 to 19 year olds, or increasing age at first marriage do affect fertility changes at this age, but that there may be other factors that are equally, if not more, important. Mensch, Grant et al. (2005) found that in there were differences in the exposure to premarital sex and in actual rates of premarital sex in 19 countries in sub-Saharan Africa. These differences by country suggest a need to consider cultural and social factors affecting adolescent childbearing (Bledsoe and Cohen 1993).

Once fertility changes at all ages are taken together, the effect of changing proportions married begins to be relatively small in lower fertility countries, as described above. This is consistent with recent studies which have found a small effect of changing age at marriage on overall fertility (such asGarenne and Macro 2008; Westoff et al. 2013).

The results of the competing effects at ages other than adolescence also provide us with useful insight. In particular, they feed into discussions about the progress of fertility decline in SSA. Current discussions regarding progress of fertility transitions in SSA have focused on examining continued fertility decline versus halted decline or increase in fertility (Bongaarts 2008; Ezeh, Mberu and Emina 2009; Garenne 2008; Schoumaker 2009; Shapiro et al. 2010; Westoff and Cross 2006). Off the countries examined here, previous studies have identified stalls in Kenya, Nigeria, Rwanda, and Zimbabwe (Bongaarts 2008; Ezeh et al. 2009; Garenne 2008; Schoumaker 2009; Shapiro et al. 2010; Westoff and Cross 2006). There has, however, not been consensus on the causes of the stalls in fertility.

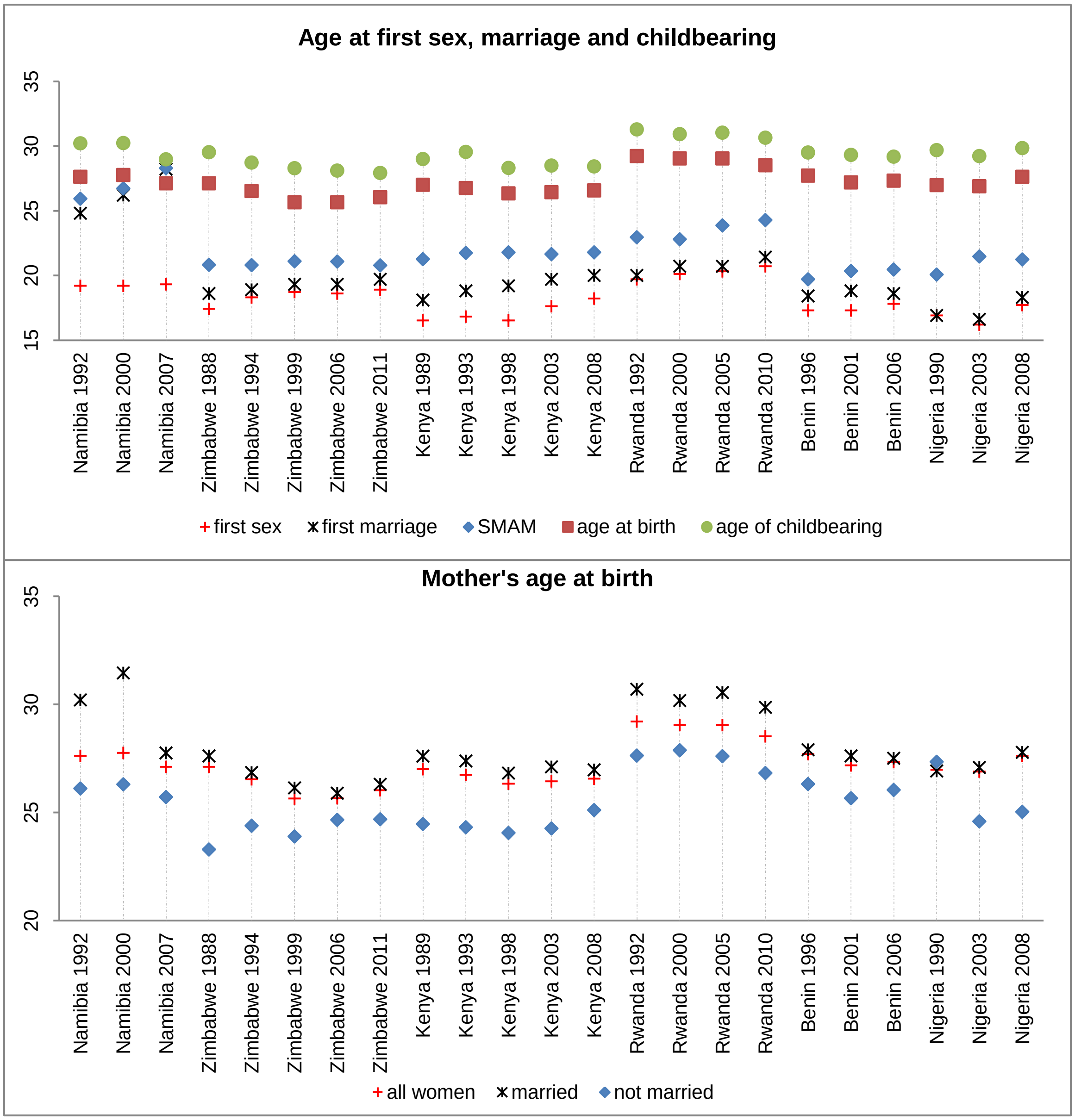
Although the current study cannot provide explanations for the stalls, it can give us insight into changes in fertility during periods of stalling fertility. The initial period of stall in Zimbabwe was the period between the 1999 and 2005/06 surveys. Declining marital fertility and marriage rates inhibited fertility in the period prior to this. These effects were reduced to almost zero during the stalling period. The only effect on fertility trends during the stall was decreasing nonmarital fertility, but this effect was small. The small change in fertility during this stalling period, masked non-systematic upwards and downwards changes in fertility at different ages. After this period, effects of marital fertility and increasing marriage rates pushed fertility upwards. The overall increase in fertility rates was primarily among women aged 25+. The stalling period was therefore a period in which both marital fertility and marriage rates changed course. In Kenya, fertility declined primarily due to declining marital and nonmarital fertility rates in the periods prior to the stall. In the period of the stall (between the 1998 and 2003 surveys), decline in marriage rates pushed fertility down, particularly among women aged younger than 30. This decline countered increasing marital and nonmarital fertility rates, to result in a small fertility change. During the stalling period, the increase in marital fertility was centered in the middle of the age distribution, and the increase in nonmarital fertility at the beginning of the distribution. The Rwanda stall was registered between the 2000 and 2005 surveys. Age distribution changes, and increasing marital and nonmarital fertility rates all pushed fertility upwards during this period. Overall fertility increase was primarily among 20 to 34 year old women, and this increase countered declines at the other ages. Finally, fertility did not change much during the period of observation in Nigeria, and the dynamics of the effects in both periods have been discussed above.

The insistent effect in these countries during stalling fertility decline was increasing fertility; mainly that of married but also of single women. These increases were mainly centered on women in the middle of the childbearing age range.

The results of this study also have important implications for future growth. Fertility changes have a large impact on population growth. Age-specific fertility changes are particularly important: changes in fertility among younger women will have higher effects on growth than fertility changes among older women, because fertility is higher at younger ages (Palmore and Gardner 1994). The differences in the effects on fertility change at each age are therefore important because they may help us to understand future trends. This study shows that increasing the age at marriage may result in lower fertility for women aged less than 25, but that this would have smaller effects on the fertility of older women. The age-patterns of marital and nonmarital fertility are not similar in many of the countries examined here – nonmarital childbearing is shifted towards the younger age groups, whereas marital childbearing is mainly concentrated among middle ages. This may affect generation length, because assuming stable population conditions, future growth is a function of generation length (Palmore and Gardner 1994). Generation length is approximated by the average age at birth for women, i.e. it is the weighted sum of female ASFRs, where the weights are the mid-interval ages of women (Palmore and Gardner 1994). The shorter the generation length, the more rapidly a population replaces itself. Therefore as marriage patterns change and fertility occurs increasingly frequently to nonmarried individuals, it is important to understand how shifts in the locus of age-specific fertility will affect generation replacement.

Figure 1-20 shows that mother's age at birth is lower for single women than married women in all countries. The gap between the two narrowed slightly for all countries but Rwanda and Namibia, where it was mainly invariant. In almost all countries married mothers' age at birth declined over time. In Namibia and Rwanda, mean age for single mothers declined; and in Zimbabwe, Kenya, Benin, and Nigeria there was a general upward trend. Namibia and Rwanda were the two countries with the largest proportions of single women. In East and Southern Africa, the age at first marriage has increased in successive surveys. The steepest increase was in Namibia. With the exception of Namibia, the age at first sex has also increased, essentially ensuring that the gap between the two ages is mostly unchanging. The gap has narrowed slightly in Benin, and increased slightly in Nigeria. These differences suggest that birth interval dynamics by marital status may have significant implications for fertility.

Figure 1-20: Ages at birth, first sex, and first marriage



Note: age of childbearing is the number of births weighted by age, whereas age at birth if ASFRs weighted by age.

Because of high fertility levels, a large proportion of the population in sub-Saharan Africa is young (Tabutin and Schoumaker 2004). As such, shifts in age distribution are expected to affect future fertility trends, because fertility is concentrated at these young ages. This study shows that changing age distribution has not had much effect on fertility changes in Namibia, Zimbabwe, and Kenya. In Rwanda, changes in age distribution were most likely associated with the genocide of 1994. These changes depressed fertility between the 1992 and 2000 survey; mainly between ages 25 and 35 (Figure 1-10), and in subsequent periods, age distribution changes pushed fertility upwards. Changing age distribution also had large effects in the highest fertility countries – Benin and Nigeria. This highlights the urgent need to reduce age-specific fertility rates so that they counter the expected future effects of changes in the age distribution.

1.5 Conclusions

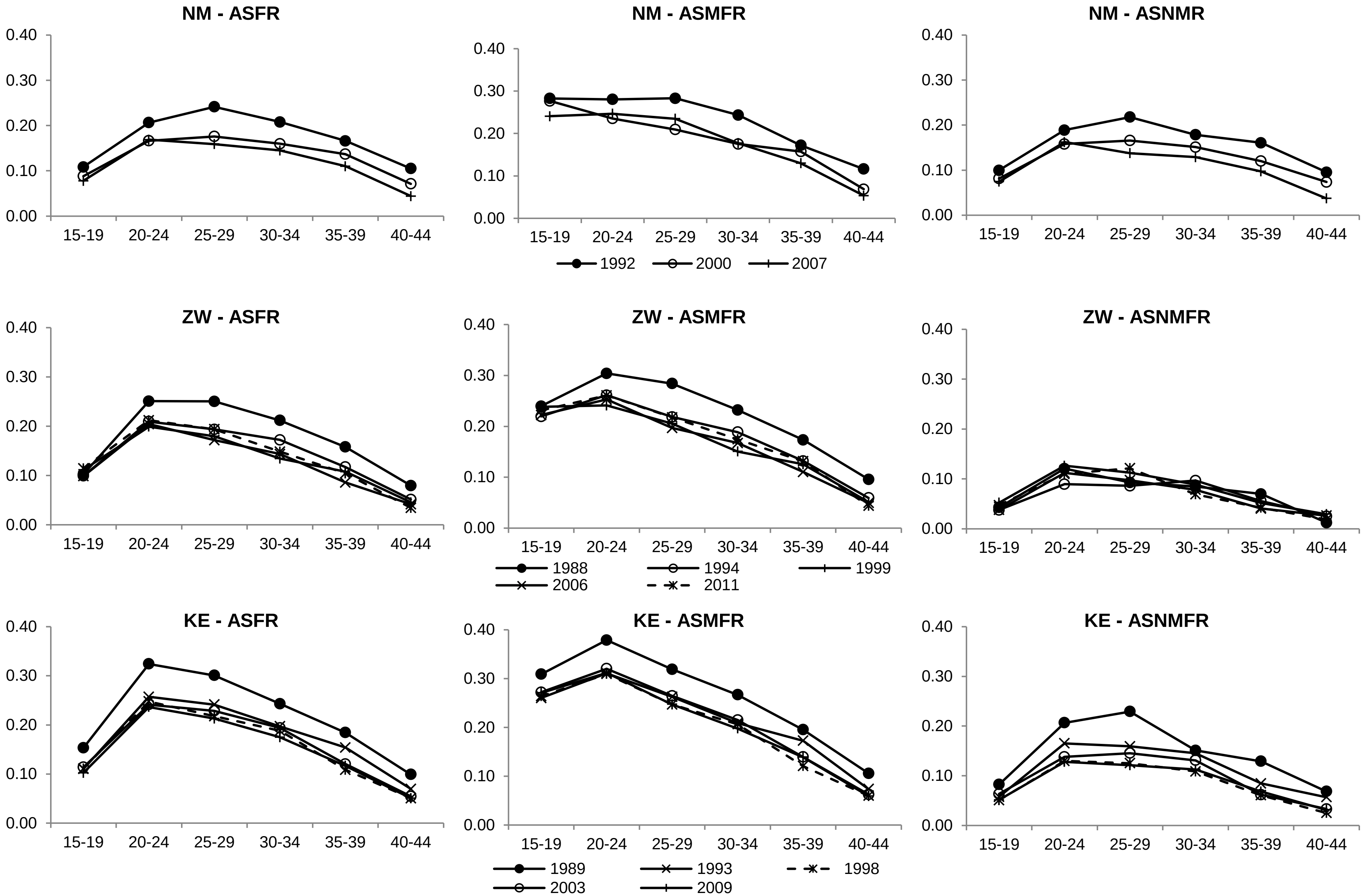
I set out to examine the relationship between changing marriage and fertility transitions in six sub-Saharan countries. This study shows that in countries with lower fertility, changing marriage rates have had less of an effect on overall fertility trends, relative to marital and nonmarital fertility rates, than in higher fertility countries. While rates of cohabitation and entering into marriage had some effects on fertility, divorce, widowhood, polygyny, and nonmarriage rates had negligible effects on fertility changes. Effects varied by age, with changing rates of entering into marriage primarily affecting fertility rates of the youngest women, and the fertility at older women primarily responding to changing levels of marital and nonmarital fertility. Relative importance of effects changed over time. Future research will examine the robustness of these findings for other countries in SSA.

A number of questions were generated in the analyses of the results of this study, and these will be explored in the future analyses: 1) the results suggested that the determinants of marital and nonmarital fertility may be similar. It will be useful to examine fertility determinants for married and single women. 2) exposure to childbearing may be different for women in different statuses, especially at young ages. An analysis of the proximate determinants of fertility by marital status will provide insight on that. 3) age at childbearing differed for women by marital status. This motivates the need to examine birth intervals and other aspects of parity progression by status. 4) the differences in the effects at different ages also suggest a need to examine fertility dynamics for women at different parities because the behavior at each age is a sum of behaviors at different parities.

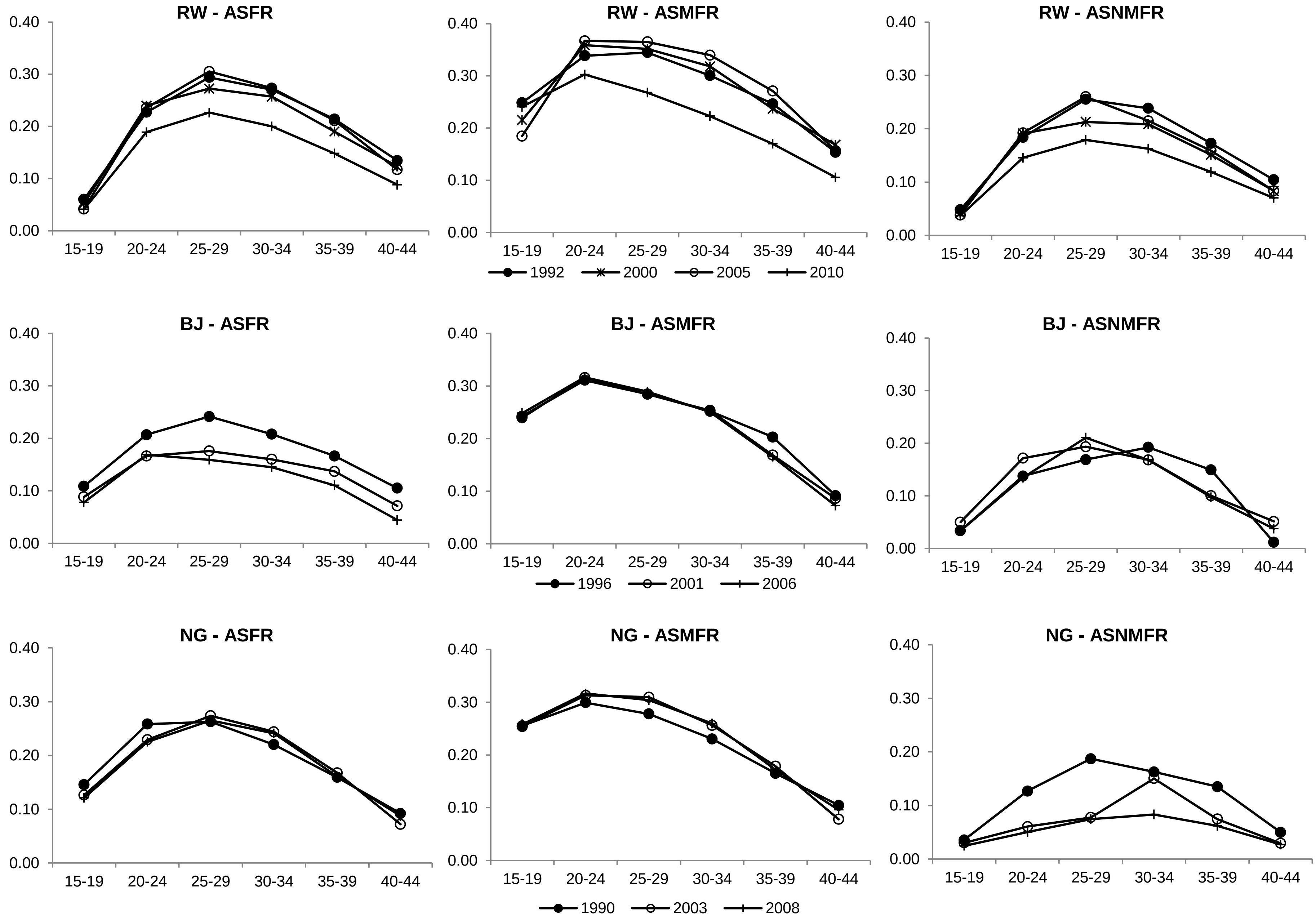
The limitations of these analyses may have important implications for the interpretation of results. The first, and perhaps biggest problem, is the problematic definition and measurement of marriage in SSA (Meekers 1992). These problems have been highlighted in the introductory chapter. I contend therefore that the results observed in this paper may be an artifact of changing definitions of marriage in different surveys, or in differences in the definition of marriage by different women. There is no way to ascertain the magnitude of the error this introduces using these data.

Second, in my analyses I assumed that marital status at the time of interview had prevailed in the three years leading up to the survey. This may or may not be true. There is no way to verify this for most of the surveys. The relationships calendars collected alongside the contraceptive calendars in the Zimbabwean DHS surveys show that relationship status does change for some women in the three year period before the interviews, but that for a larger proportion of women, they are either constantly either in or out of a relationship over the entire period of observation. We do not, however, know if they are in the same relationship status over time, or if they switch, for example, from cohabitation to marriage.

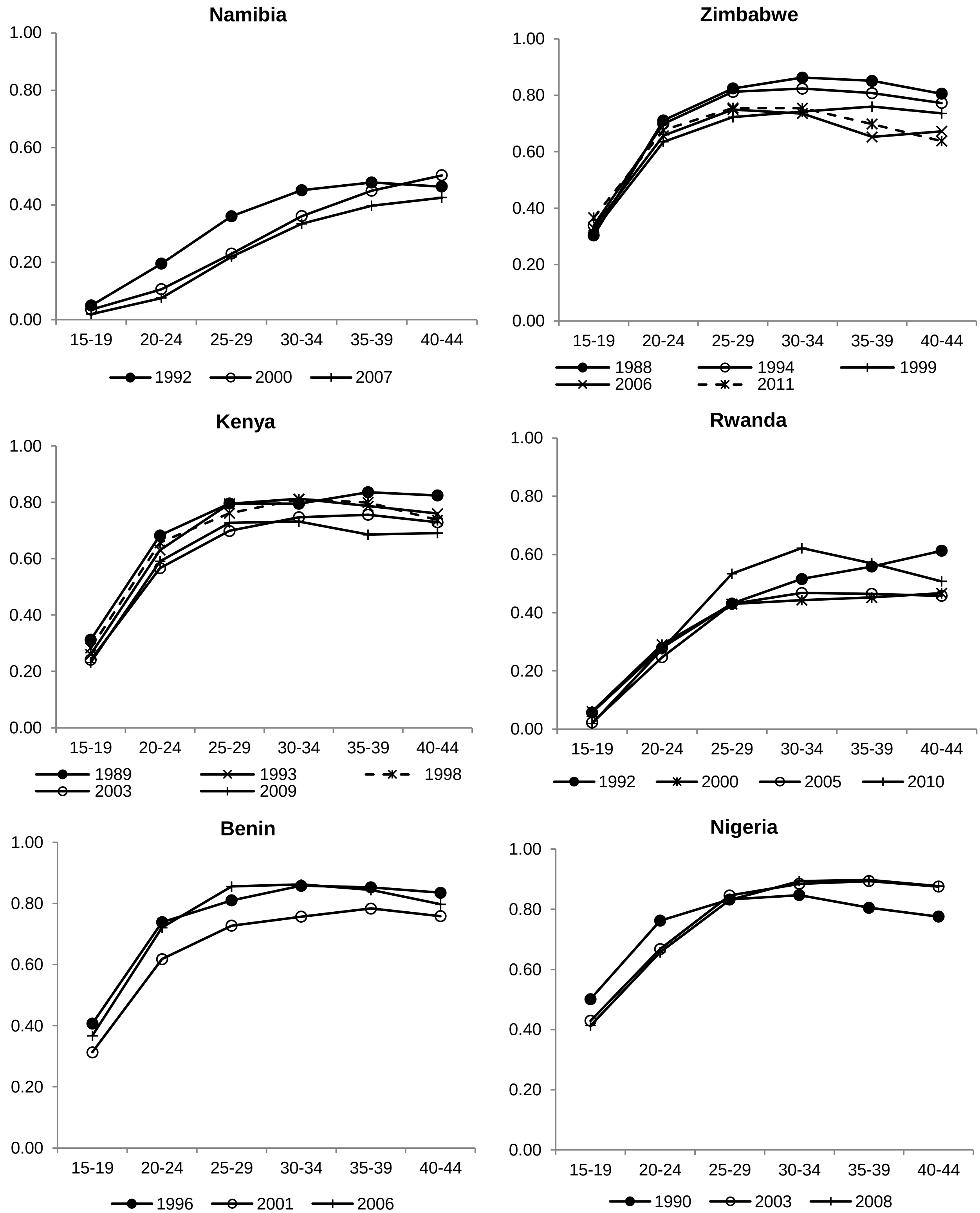
Appendix 1: Age-specific fertility rates



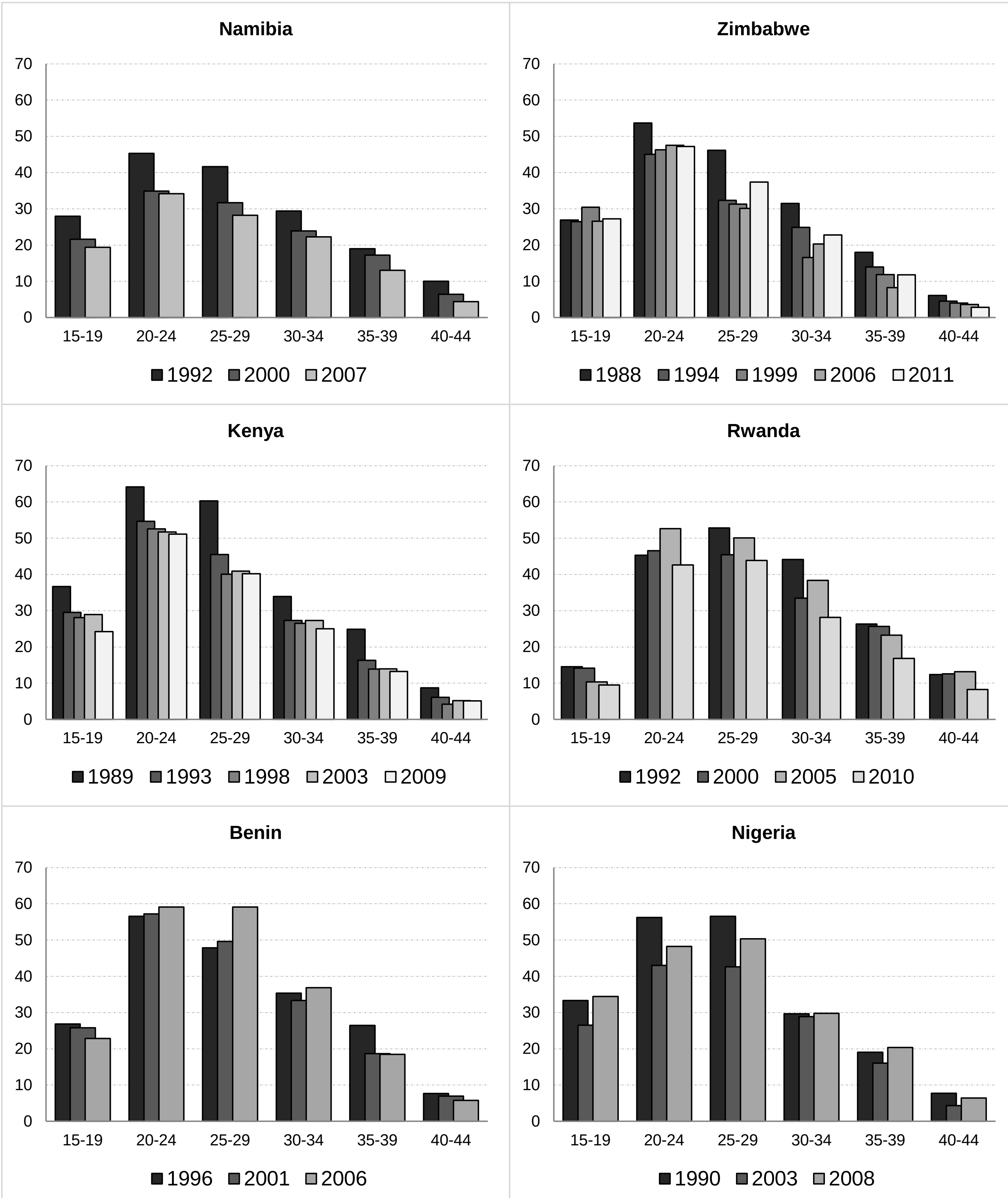
Age-specific fertility rates



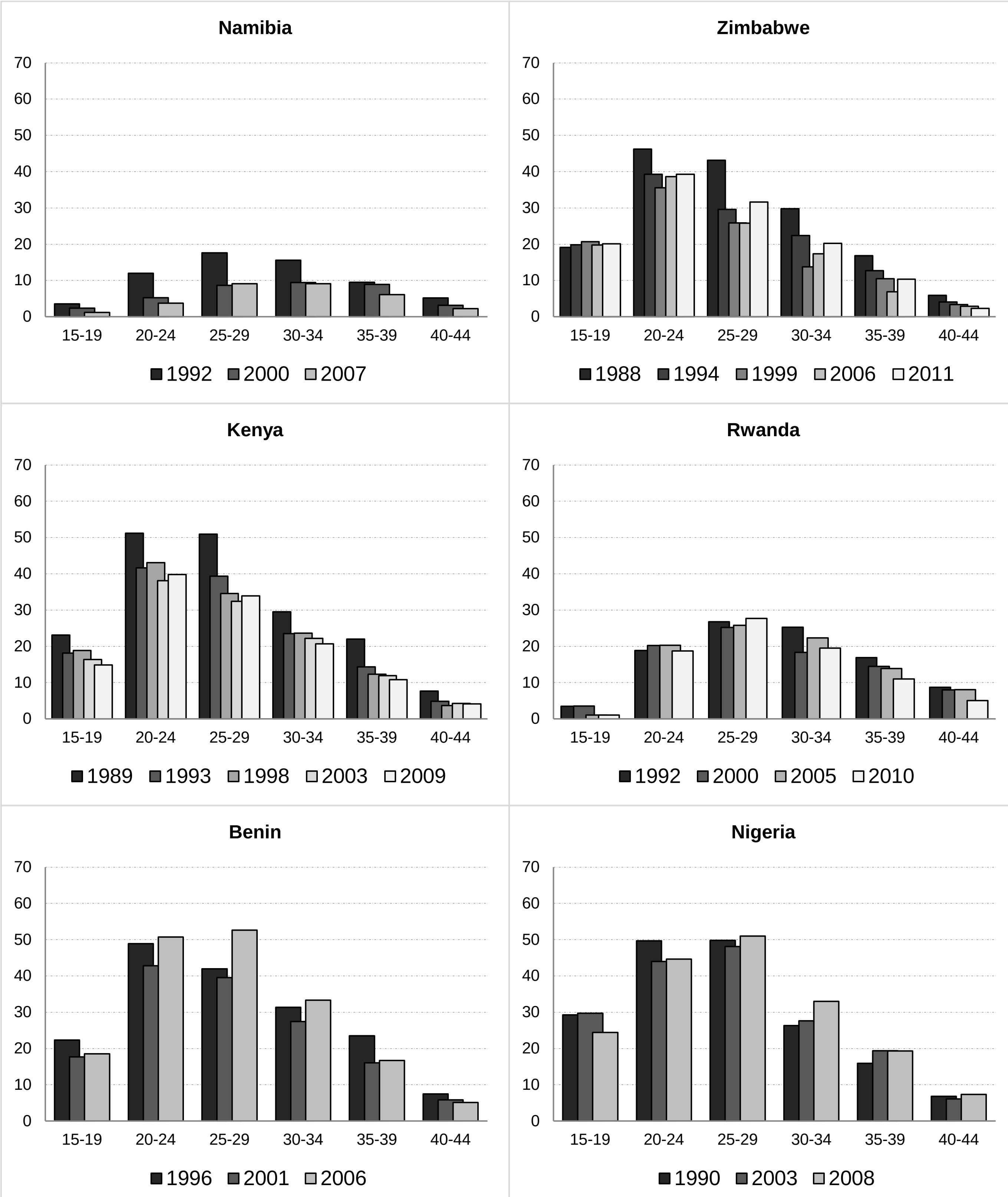
Appendix 2: Age-specific marriage rates



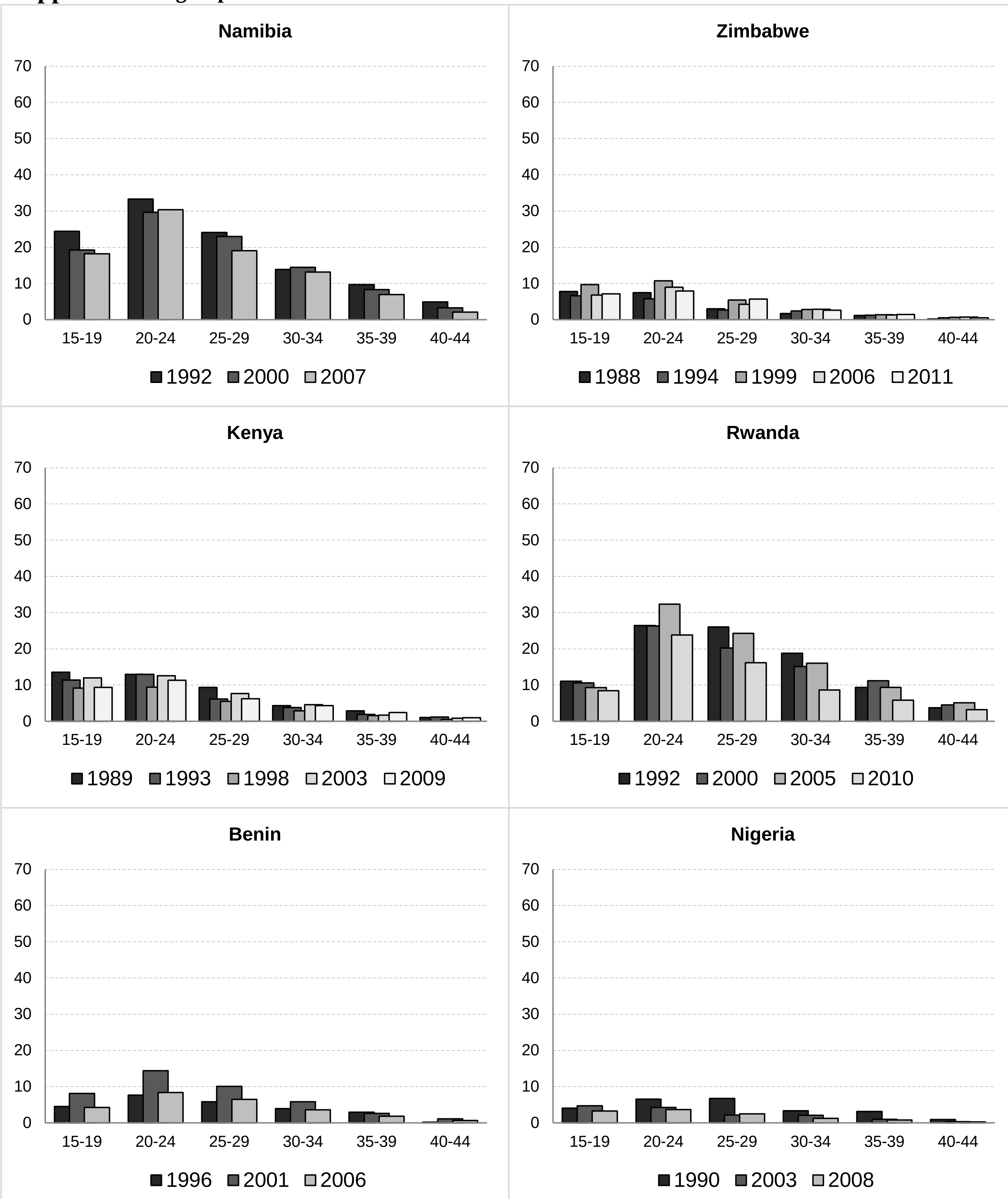
Appendix 3: Age-specific GFRs in the six case studies



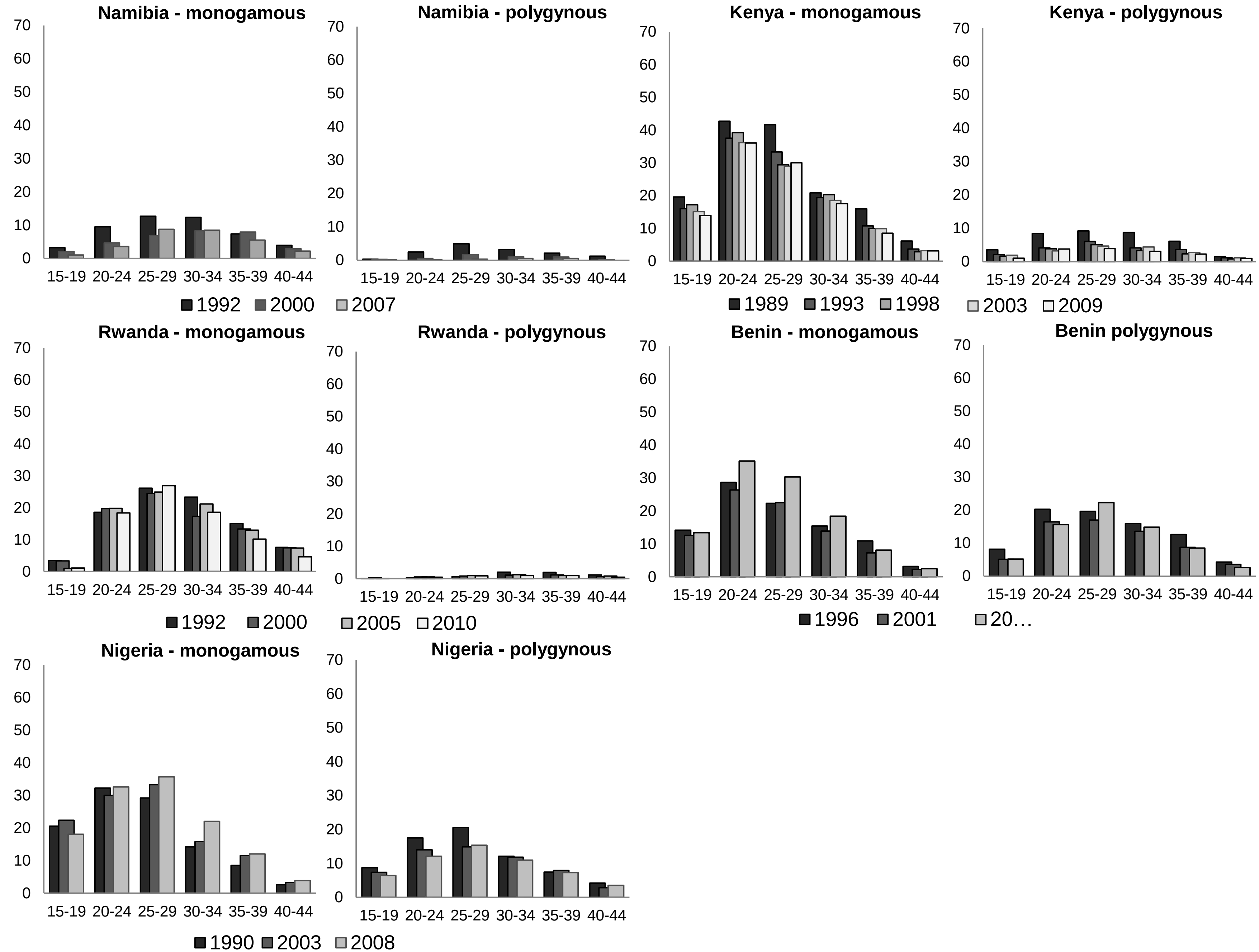
Appendix 4: Age- specific marital GFRs in the six case studies



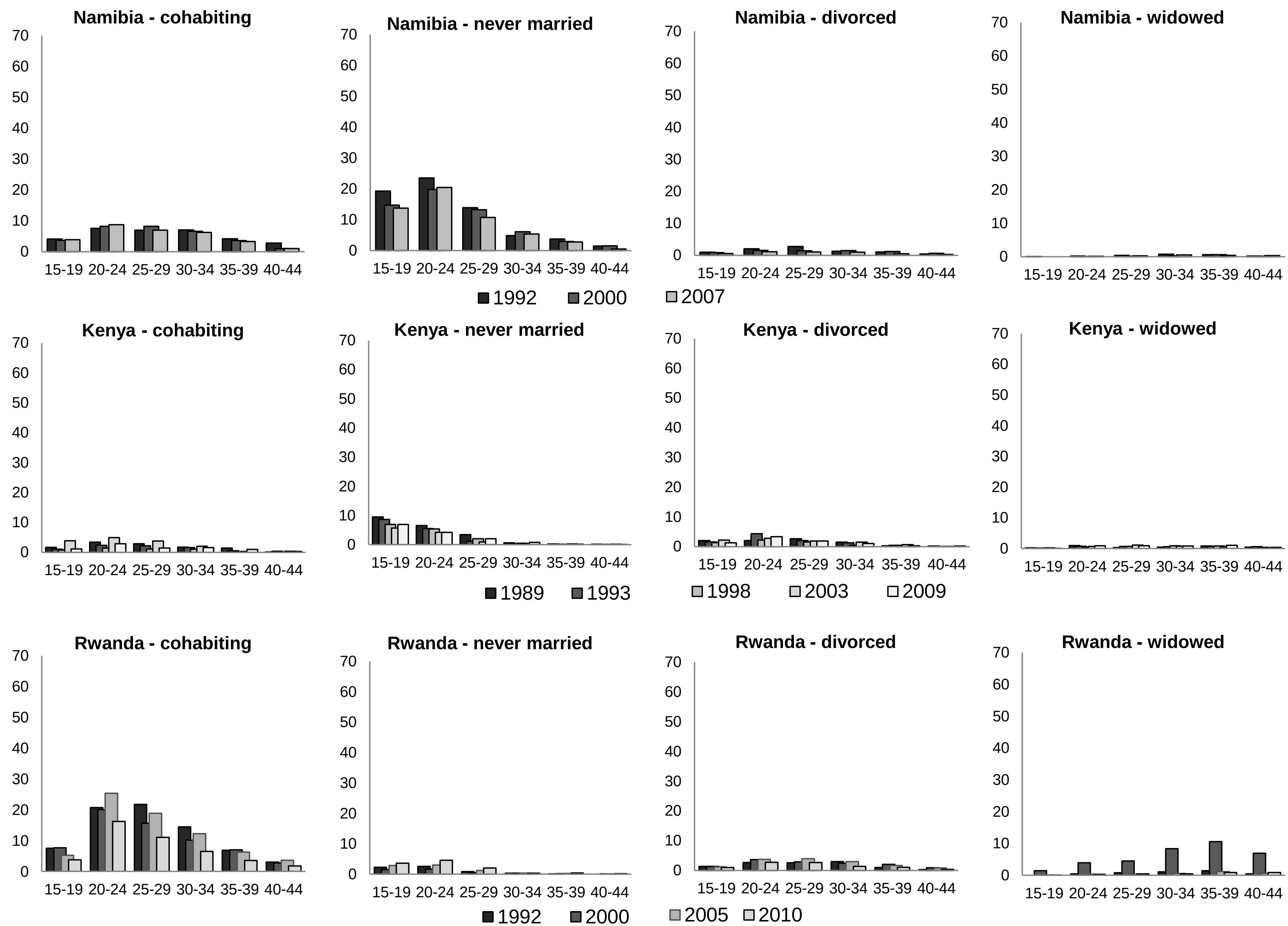
Appendix 5: **Age- specific nonmarital GFRs in the six case studies**



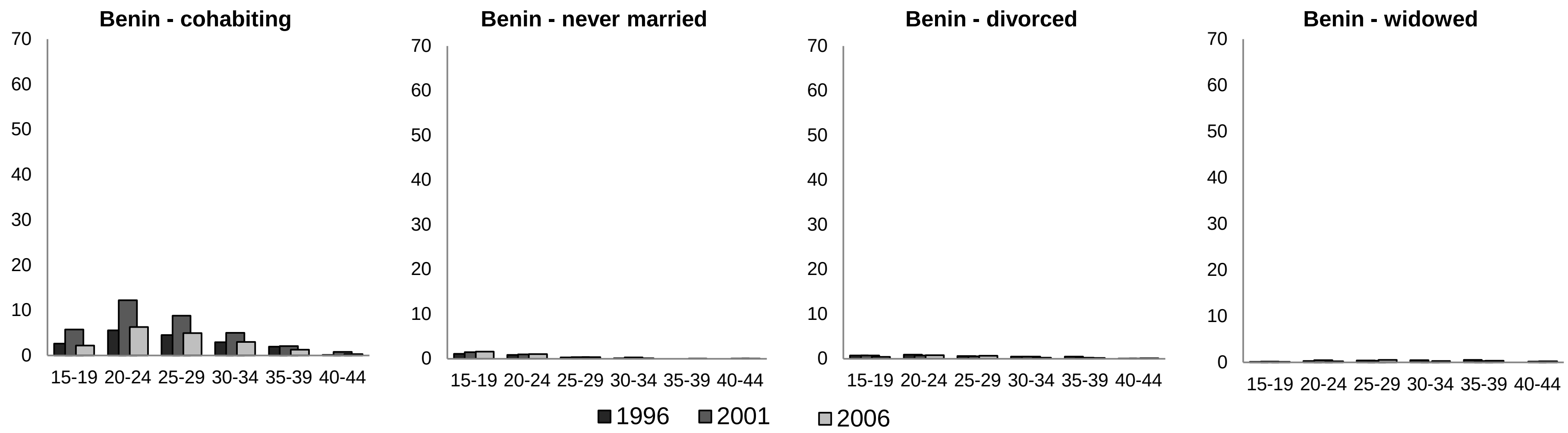
Appendix 6: Age-specific marital GFRs



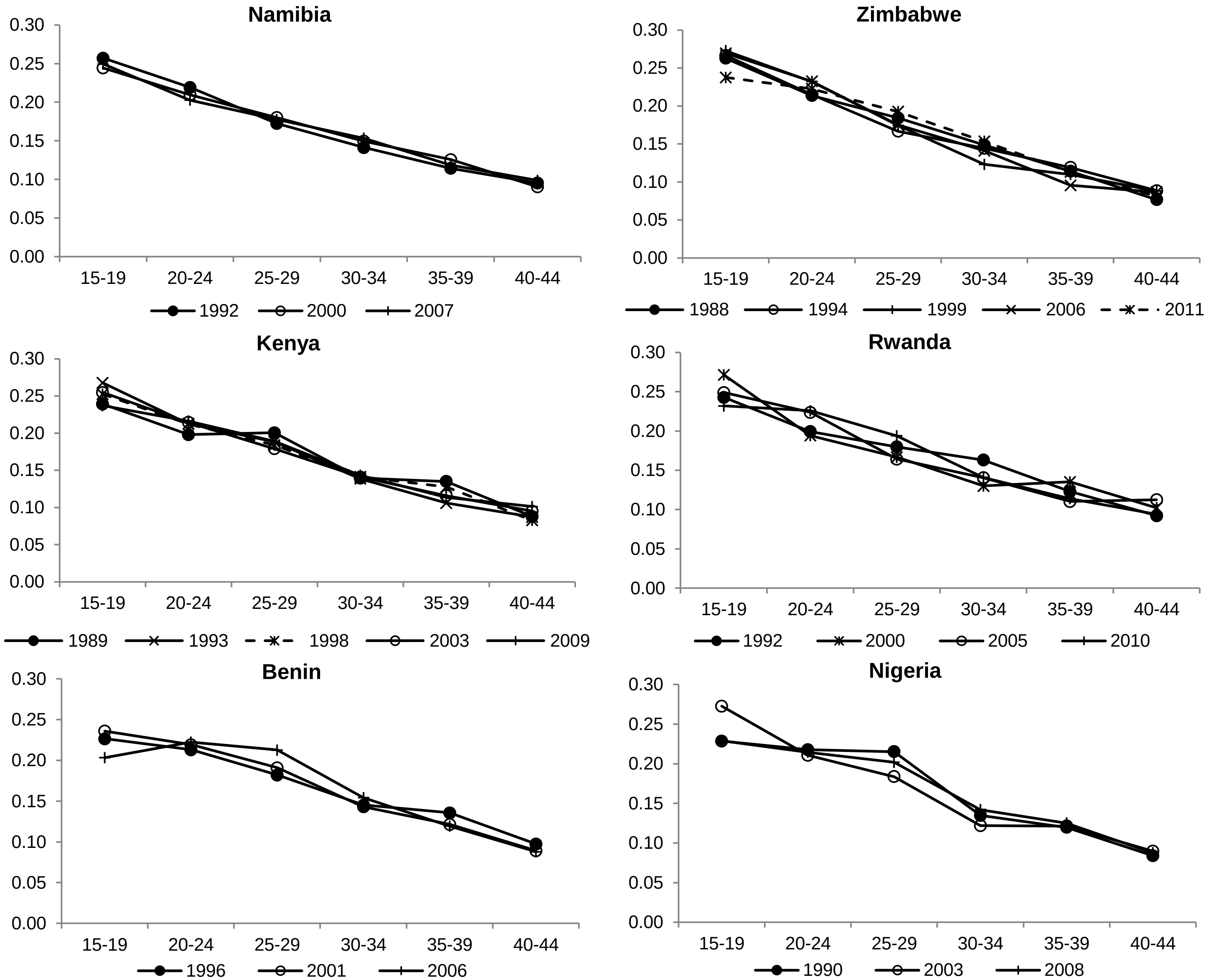
Appendix 7: Age-specific nonmarital GFRs



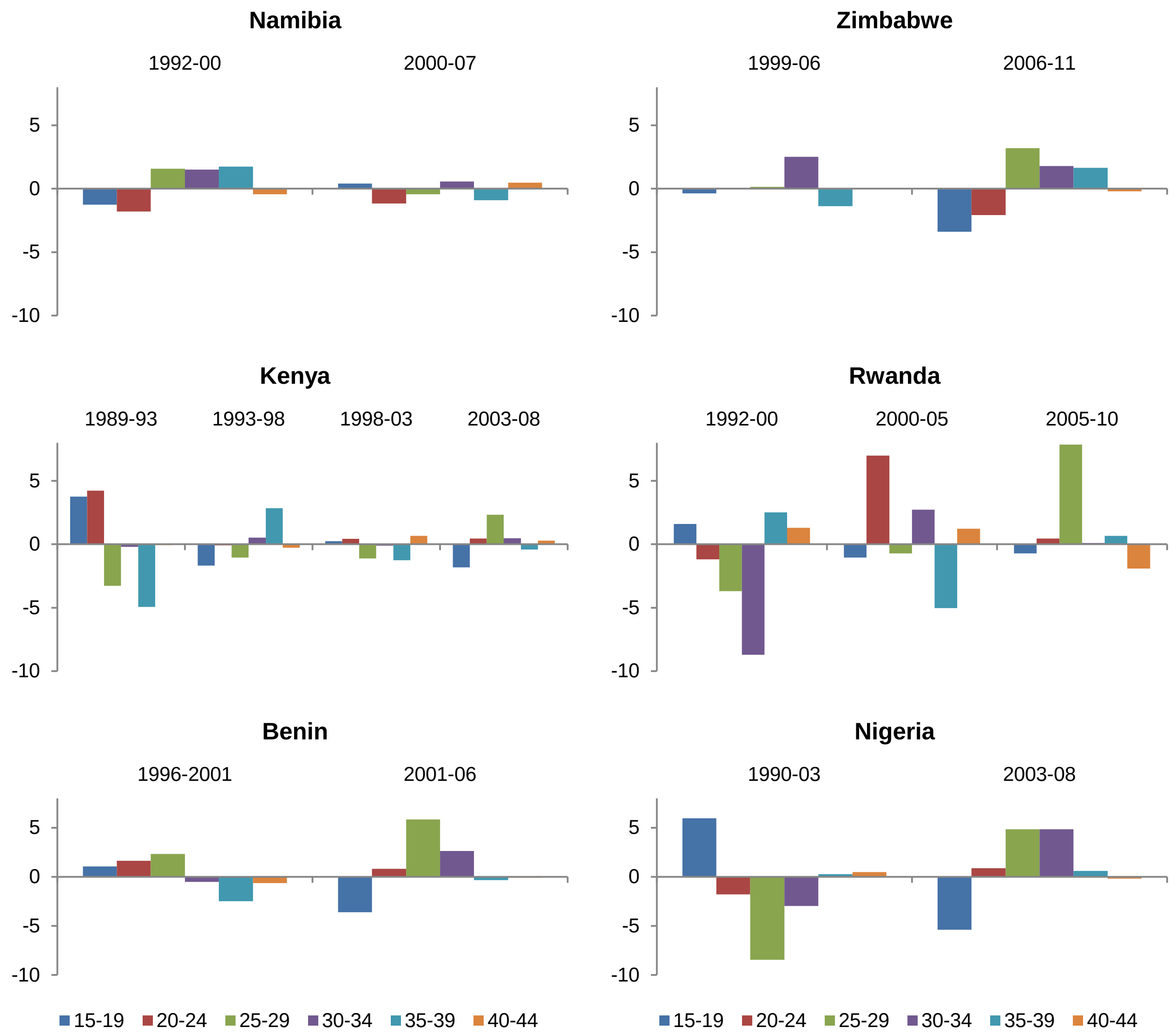
Age-specific nonmarital GFRs



Appendix 8: Age distribution by age and survey



Appendix 9: Effects of age distribution changes



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