Stalls and Reversals in Age at First Marriage in sub-Saharan Africa: The Role of Female Education Expansion

Short title: Education Expansion and Age at Marriage in Africa

Ben Malinga John[1,2,3] & Natalie Nitsche[1]

1. Max Planck Institute for Demographic Research (MPIDR)
2. Stockholm University
3. Department of Population Studies, University of Malawi

Contact details

Ben Malinga John

Email: **john@demogr.mpg.de / bjohn@unima.ac.mw**

Natalie Nitsche

Email: **nitsche@demogr.mpg.de**

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Abstract

Age at first marriage stalled in some sub-Saharan African (SSA) regions despite ongoing female education expansion. This paradox constitutes a major demographic puzzle, however, a systematic investigation of where, over which birth cohorts, and why such stalls occurred is lacking. This paper analyzes these dimensions among women born 1945-1999 in four broad SSA regions (West, Central, East and Southern Africa) and 33 countries using Demographic Health Survey data. Findings reveal that median age at first marriage (MAFM) at the population level stalled in 12 countries and reversed in nine countries. At the regional level, MAFM stalled in Central and East Africa and reversed in Southern Africa. The stalls and reversals occurred primarily among the 1965-69 – 1985-89 birth cohorts and at a range of MAFM (15.6-31.1). In some regions, stalls or reversals emerged because female education expansion dominated primary education, while in others, they emerged because age at marriage within specific education groups stalled or reversed. However, the pace of progress for girls' participation in secondary schooling was the most essential condition for stalls or reversals to emerge at the population level. We discuss the implications of these findings for policy/programs aiming at eradicating early marriages in SSA.

Keywords: Union formation, Age at marriage, Female education, sub-Saharan Africa

Introduction

Marriage is one of the key markers of transition to adulthood in sub–Saharan Africa (SSA). The timing of this event can predefines an individual's life course trajectory: Women who marry at younger ages face a higher risk of early childbearing (Jensen and Thornton 2003) and experience more pregnancy-related complications (Althabe, Moore et al. 2015, Grønvik and Fossgard Sandøy 2018). Early union formation is also linked to a higher likelihood of experiencing intimate partner violence and union dissolution (Clark and Brauner-Otto 2015, Kidman 2017), which adversely affects women's socioeconomic and health outcomes. Thus, understanding changes in marital timing over time, space, and across generations, and illuminating the factors that explain such behavioral change, particularly in settings where early marriages are common, is important for improving women's reproductive health and socioeconomic outcomes.

In SSA, marriage was marked as early and universal, at least until the late 1990s. The median age at first marriage (henceforth, MAFM) among women varied between 15–19 years in most countries (Westoff and Macro 2003, Garenne 2004). This pattern is slowly shifting, with age at marriage rising in several countries (Garenne 2004, Mensch, Singh et al. 2005, Posel and Rudwick 2013, Hertrich 2017). Prior research linked these changes to female education expansion (Mensch, Singh et al. 2005, Shapiro and Gebreselassie 2014, Bongaarts, Mensch et al. 2017). This connection is mainly theorized to operate through the postponement of marriage until after schooling is finalized (Lloyd and Mensch 2008, Glynn, Sunny et al. 2018, Zuilkowski, Henning et al. 2019). Thus, age at marriage is generally anticipated to increase as long as female education expansion occurs, via educational compositional change. Grant (2015) termed such kind of expectations "the demographic promise of expanded female education." (p.2).

However, in some SSA countries such as Burkina Faso, Chad, Ethiopia, Madagascar, Malawi, and Zimbabwe, girls' school participation expanded substantially without considerable marital timing delays (ICF 2015, Bongaarts, Mensch et al. 2017). Mensch, Singh et al. (2005) observed a similar pattern, noting that in about one–third of SSA countries, the level of the observed decrease in the proportion of women married before age 18 was merely less than half of what they predicted (using a regression model) based on observed changes in educational attainment. Stalls have also been observed concerning the timing of other reproductive events, such as first births (Grant 2015). Thus, the paradox of stalls or reversals in the timing of first marriage or first birth despite female education expansion has emerged in SSA.

Few studies have discussed this paradox and linked it to conditions connected to female education expansion. Those who did mention several possible explanatory factors: poor quality of education following the introduction of free primary education in the 1990s and 2000s, the change in age patterns of school enrollment, or lowered selectivity of women who attended school in recent decades (Grant 2015, Bongaarts, Mensch et al. 2017). Grant (2015) discussed this paradox regarding changes in the timing of first birth in Malawi. Bongaarts, Mensch et al. (2017), discussed this paradox in relation to the results they observed in Ethiopia when analyzing the role of education on the timing of first marriage, first sex, and first birth across the global south. Bongaarts, Mensch et al.'s (2017) work, however, was not primarily set to assess the linkages between female education expansion and stalls in the timing of reproductive events. Indeed, their discussion of this paradox can be regarded as the building of hypotheses open for empirical investigation.

A systematic empirical investigation of this paradox and across all of SSA counties is, thus, necessary to advance our understanding of changing patterns in age at first marriage and how they

are linked to educational expansion in this region. Therefore, we use data from Demographic and Health Surveys (DHS) to extend the discussion of this paradox in two ways. First, we perform a focused empirical investigation of the occurrence of this paradox in four broad SSA regions (West, Central, East and Southern Africa) and 33 individual countries. Second, we bring a birth cohort perspective to the investigation of this paradox. This approach allows us to document long-term cohort changes in the linkage between age at first marriage and female education expansion. Specifically, it permits examining the marital timing experiences of different birth cohorts of women across different regimes of female education expansion.

Our study has two objectives. The first objective is to identify SSA regions, countries and birth cohorts over which the age at first marriage at the population level stalled or reversed. We also identify the ages at which such stalls or reversals occurred. The second objective is to describe the conditions that gave rise to such stalls or reversals. Specifically, we assess two competing explanations for why marital age at the population level may have stalled despite ongoing female education expansion (incompatibility vs. ideational/economic). The incompatibility hypothesis suggests that stalls or reversals in age at marriage at the population level emerged because female education expansion dominated primary schooling. If schooling ends at a young age, its expansion is still compatible with early marriages. The ideation/economic hypothesis suggests that the inflow of larger, less selective groups into education led to ideational change and lowered economic opportunities for each specific education group, thereby leading to reversals in age at marriage within education groups and in turn at the population level. We evaluate the alignment of the change in MAFM and female education composition over birth cohorts and use decomposition analysis of cohort changes in marriage rates to evaluate these two explanations.

Background

Expansion of female education and marital timing changes in sub–Saharan Africa

In SSA, education attainment is tied to the postponement of marriage through at least three dominant pathways. First is the incompatibility hypothesis, which postulates that the time women spend in school is directly linked to their union formation timing due to an incompatibility of simultaneous school enrollment and family formation. School attendance generally means postponing marriages to later ages, while initiating family signals discontinuity of schooling (Lloyd and Mensch 2008, Glynn, Sunny et al. 2018, Zuilkowski, Henning et al. 2019). Thus, the longer women stay in school, the more marriages are delayed to later ages. Therefore, the strength of this mechanism is contingent on at least the age at school enrollment, the pace of grade progression, school completion rates, the age at school graduation, and opportunities for girls to proceed further with education beyond the primary and secondary level. A high completion rate would imply staying longer in school – at least for as many years as required to graduate – hence, it would likely lead to the postponement of union formation.

However, if school starts at younger ages and progression through grades is rapid, one could complete primary or secondary school education and still marry early. Caudillo (2019) found evidence for this possibility in Mexico, where girls aged 10–17 who experienced advanced grade progression had early initiation of marriage. Similarly, Nguyen and Lewis (2020) observed that women who started schooling at a younger age were 5.5 times more likely to marry during their adolescent years than those who delayed school enrollment in Vietnam. These findings suggest that the benefits of improved school completion rates (corresponding to improved completed years of schooling) in delaying union formation could be attenuated by improvements in age at school

entry and grade progression rates, mainly if girls' opportunities to progress beyond primary or secondary education are limited. Thus, the incompatibility hypothesis implies that the structure of female education expansion – i.e. whether it is marked mainly by girls' primary or secondary schooling – likely shapes the pattern of age at marriage at the population level.

The second mechanism, the ideational hypothesis, is related to changing norms about the timing of marriage that comes with exposure to and acquisition of knowledge or ideas that challenges traditional family formation values (Caldwell 1980). In SSA, societies have unique customs and systems that govern collective behavior, including the timing of first union formation (Mawere and Mawere 2010, Ogoma 2014). Education exposes young girls to new ideas and brings aspirations and opportunities that weaken these norms. The importance of this mechanism is thus dependent on the magnitude of the influence schooling offers in redefining individual perspectives, preferences, and values about marriage timing. Therefore, the education effect on marital timing would diminish if more girls complete their education without acquiring the necessary skills or knowledge (what other scholars have referred to as "enrollment without learning" (Bold, Filmer et al. 2017) that stimulate a desire to postpone marriages to later ages. This could lead to stalls or reversals in age at marriage within specific education groups, which could then lead to stalls or reversals in age at marriage at the population level despite ongoing compositional education expansion.

More related to the ideational mechanisms is Becker (1973)'s economic theory of marriage, which argues that girls could use marriage as financial security or parents could marry their daughters early to shift the economic burden of supporting them to their new spouses. Parents could also marry young girls sooner to mitigate economic shocks (Corno, Hildebrandt et al. 2020). As a human capital investment, education raises opportunities for girls to participate in wage

employment, thus boosting their financial independence and reducing the need for an early marriage. Equally, educated parents are likely economically self–reliant, thus less inclined to push their daughters into early marriages for economic gains. However, similarly to ideational mechanisms, the strength of the education effect on union formation modulated by economic forces is likely to depend on the knowledge and skills one develops in school and the growth of economies as education becomes widespread. Thus, early marriage could still be an alternative pathway to financial security if young girls who complete primary or secondary education lack the opportunity to join wage employment (either because of limited skills or limited employment opportunities). In this case, expansion of female education could lead to stalls or reversals in age at marriage for these education groups, and consequently at the population level, via lowered employment opportunities as more women gain education and compete for wage labour.

The sub–Saharan Africa context and research hypotheses

The dynamics of female education composition and expansion in SSA, taken together with the incompatibility and ideational/economic mechanisms discussed above, helps us draw specific hypotheses about linkages between education expansion and marital timing stalls or reversals in this region. SSA countries witnessed an increase in girls' school participation over the last three decades. Data from DHS indicate that among women aged 20-49 interviewed between 1990–1999[1], 53.4% had ever attended at least primary school, 16.9% had secondary education, and 1.6% had tertiary education. The corresponding estimates among women interviewed between 2010–2019[2] are 62.3%, 25.5%, and 5.9%, respectively. These averages obscure regional heterogeneity

[1,2] Author's calculation based on data from DHS in SSA

in timing, pace and structure (whether it mainly dominated primary education) of female education expansion. In broad terms, countries in Southern Africa are precursors of this transition, and the pattern of girls' school participation in most Central and East African countries lies between those of West and Southern Africa (Frye and Lopus 2018). In connection with the incompatibility hypothesis, we, therefore, hypothesize that **(H1)** *stalls or reversals in age at marriage at the population level emerged because female education expansion dominated primary schooling, which is more compatible with early marriages*. *Thus, we expect that age at first marriage at the population level stalled or reversed in SSA regions, countries and over birth cohorts for which female school participation beyond primary education stalled or declined.*

Our alternative hypothesis to H1 relates to the ideational/economic mechanism. Female education expansion in SSA is marked by declines in age at school entry and falling grade repeating rates (Ndaruhutse 2008, Lucas and Mbiti 2012, Grant 2015, World Bank 2020). Thus, women from recent birth cohorts are more likely to have graduated from primary or secondary school at relatively younger ages than those born some generations ago. As argued above, such patterns are likely associated with early marriages, mainly when opportunities for girls to proceed further with education beyond primary or secondary education are limited, as in most SSA countries. Female participation in wage employment can, thus, be considered as an alternative pathway to keep young girls who have completed primary or secondary education from early marriages in this region. However, the growth of SSA's economy did not keep up with increasing girls' school participation; the supply of primary or secondary school leavers now exceeds the labour market demand (Al-Samarrai and Bennell 2007, Filmer and Fox 2014). Thus, in many SSA countries, early marriages may be perceived as practical means to girls' financial security, even among secondary education graduates. Furthermore, SSA witnessed a deterioration of education

quality (Bold, Filmer et al. 2017, Filmer, Rogers et al. 2020, Evans and Mendez Acosta 2021), mainly due to the influx of schools following free primary education. For example, students complete their primary schooling in some countries without attaining the necessary reading and writing skills (Bold, Filmer et al. 2017). These dynamics imply that the composition of women constituting the primary or secondary education group might have become less selected for ideologies and economic activities that inhibit early marriages as girl's school participation expanded. Therefore, as an alternative to H1, we hypothesize that **(H2)** *stalls or reversals in age at marriage at the population level emerged due to reversals in age at marriage within specific education groups, particularly among women with primary and secondary education.*

However, evidence for H2 is necessary but insufficient to attribute stalls or reversals in age at marriage to female education expansion. Indeed, stalls or reversals in age at marriage within specific education groups could emerge from other factors unrelated to ideologies and economic mechanism we discussed, for example the emergence of new cultural norms favoring early marriages. In such cases, age at marriage within education groups, and thus at population level, could stall or reverse even without female education expansion. Therefore, we set three additional hypotheses to evaluate whether stalls or reversals in age at marriage within specific education groups (if any) are attributable to female education expansion. The ideational and economic mechanisms we described suggest that if such is the case then stalls and reversals in age at marriage within education groups are likely to coincide with an increased composition of women constituting these groups. Thus, in extension to H2, we hypothesize that (**H2a**) *stalls or reversals in age at marriage for specific education groups, occurred over birth cohorts which experienced substantial increase in girls' school participation*. Moreover, given that rural areas are generally more disadvantaged than urban areas in most socioeconomic developments, one would anticipate

that the quality of education training and employment opportunities might have been more compromised in rural areas than urban areas as female education expanded. Thus, our hypothesis is that **(H2b)** *stalls or reversals in age at marriage within specific education groups (if any) are likely to be steeper among women from rural areas than those from urban areas*. Furthermore, we hypothesize that **(H2c)** *the composition of women from rural areas constituting the primary or secondary education groups increased as female education expanded, leading to diminishing selectivity of these educating groups and then stalls or reversals in age at marriage within these education groups*. The availability of DHS data in SSA, which contains marriage histories of women born as early as 1936, offers the possibility to assess these hypotheses and provide more insights into the linkage between education expansion and age at marriage in SSA.

Data

We use data from 141 DHS conducted between 1986 and 2022 in 34 SSA countries (see, Appendix 1). DHS are the most used and reliable source of nationally representative information about family formation in this region. They collect two critical pieces of nuptiality information essential to our current analysis – i.e. whether a woman has ever married or lived with a man as married, and the date at which such unions were first formed. Women who ever formed a formal or informal union are identified as ever-married in DHS data coding. This flexibility is desirable because marriage formation is more of a process than an event in SSA (Meekers 1992, Chae 2016).

DHS also ask respondents about their highest educational attainment. This information is coded into four categories: *No education* for women who never attended school, *Primary* for those who only had some primary education, *Secondary* for those who had up to secondary education, and *Higher* for women who acquired some tertiary education. We use this information to examine

girls' school participation trajectories over birth cohorts. However, we exclude women with tertiary education (4.1% of the polled dataset of women aged 20-49) because female education expansion was mainly confined to primary and secondary levels in most SSA countries. Furthermore, we limit the analysis to women aged 20+ to exclude those still in primary school at the time of the survey but who might attain secondary education later. The primary analytical sample consists of 1,120,164 women aged 20-49 with known information about marital status, education level and known date at first marriage among those who ever married.

We grouped the 34 countries included in this analysis into four major geographical regions (West, Central, East and Southern Africa) following the standard classification (see United Nations (2022)). While single-country estimates reveal more detail, commonalities in marriage dynamics across these regions (see John and Nitsche (2022)) justify the groupings and allow larger sample sizes than single-country estimates. Nevertheless, we produced country-specific estimates for some of the analyses and summarized and presented them where necessary.

Measures and methods

Our first objective is to identify SSA regions, countries and birth cohorts over which the age at first marriage at the population level stalled or reversed and the ages at which such stalls and reversals occurred. We use the MAFM as a measure of marital timing for this analysis. We calculate these medians for five-year birth cohorts of women born between 1945 and 1999 (see Appendix 1) – for all women combined and for specific education groups (no education, primary and secondary) – using a Kaplan Meier estimator. To ensure reliable and stable estimates, we only present the results of cohorts with a sample size of at least 200 women.

A quality assessment of marriage histories collected in DHS reveals that older women tend to shift their age at first marriage towards the survey date (Gage-Brandon 1995, Mensch, Grant et al. 2006). This forward displacement of marriage events may lead to spurious small changes in marital timing estimates over birth cohorts. To alleviate this problem, we calculate MAFM for each birth cohort from a pooled sample of women born during the same period but interviewed at different survey points. Thus, these medians are generally a weighted average of marriage histories reported at younger, middle and older ages. Moreover, we have applied the sampling weights available in DHS datasets when calculating these medians.

We set two criteria to objectively identify regions, countries and birth cohorts over which the age at first marriage at the population level stalled or reversed and the ages at which such stalls and reversals occurred. First, we define stalls to correspond to intervals over which the MAFM for at least three consecutive birth cohorts are closely similar, with a slope between –0.01 and 0.01. These cutting points are arbitrary; nevertheless, we aimed at cutting points close to zero to ensure we indeed capture stalls. Second, we define reversals as intervals over which MAFM consistently declines after an interval of increase/stall for at least two consecutive birth cohorts with a slope of less than –0.01. Conversely, an increase in age at first marriage corresponds to intervals over which the MAFM for at least two consecutive birth cohorts increased monotonically with a slope of greater than 0.01 (note that in any case, we calculate slopes using a minimum of three data points).

Our second objective is to describe conditions that gave rise to stalls or reversals in age at first marriage at the population level. We evaluate whether the stalls or reversals in age at marriage at the population level emerged because female education expansion dominated primary schooling, which is more compatible with early marriages (H1) or whether they emerged because of reversals in age at marriage within specific education groups (H2). To evaluate these

hypotheses, we first assess how the education composition – % with no education, % with primary, % with secondary – and the MAFM for these three education groups are aligned with each other over birth cohorts. We achieve this assessment by plotting education-group-specific MAFM estimates and the education composition distribution over the birth cohorts on the same axis. This graphical assessment allows us to observe patterns that may suggest evidence for H1 or H2. For example, an observation of stalls or reversal in MAFM at the population level when (i) the overall composition of women attaining some schooling increased, while the percentage of women with secondary education stalled or declined, and (ii) the MAFM for the primary and secondary education group stalled, would suggest evidence for H1. The results section points out different configurations of these MAFM-education composition alignments as they emerged in the data and discusses whether they provide evidence for H1 or H2.

Second, we perform a decomposition of cohort changes in marriage rates using the decomposition-of-difference approach (Kitagawa 1955) to quantify the component of change, which is due to changes in education composition and a component due to changes in marital timing within specific education groups. This analysis allows us to formally evaluate H1 and H2 beyond the graphical assessment described above. The decomposition-of-difference technique involves decomposing the difference in rates between two groups/periods by: (i) estimating the change that would have been observed if the rates between the two groups/periods had remained the same but the composition (concerning a particular factor) had changed– i.e. change due to composition differences. (ii) estimating the change that would have been observed if the composition of the two groups/periods had remained the same but the rates had changed – i.e. a change due to group/period behavior differences (the effect component).

We use the first marriage rate before the age of 20 (hereafter, teenage marriage rate) as a measure of marital timing to perform this decomposition analysis. First marriage rates and MAFM are closely related, mainly in settings where the formation of first marriage is generally universal, like SSA. For our sample, over 75% of women were married by age 25 across all birth cohorts. This proportion is over 95% by age 40 (Appendix 2). We prefer using teenage marriage rates for this decomposition analysis for three reasons. First, in SSA, marriages are still generally early; thus, differences in MAFM more likely mirror changes in early marriage rates. Second, given the more significant proportion of women already married by age 25, the influence of education on marital timing is likely to be more sensitive to forming early marriages. Third, it is the early formation of marriages which is of practical concern in this region, not the formation of marriage as per se.

We further address the second objective by assessing whether the stalls or reversals in age at marriage within specific education groups (if any) are attributable to conditions associated with female education expansion, testing H2a, H2b and H2c. We assess H2a (stating that stalls or reversals occurred during times of education expansion) by evaluating the MAFM-education composition alignment plots described above. Support for H2a is necessary to test H2b and H2c, thus, we restrict the analysis for H2b and H2c to countries for which H2a is true.

For H2b and H2c, we perform a similar decomposition analysis as before, but now focus on differences in cohort changes in teenage marriage rates between women residing in urban and rural areas within education groups. Specifically, we examine (i) how the change in teenage marriage rates within each specific education group differed between women residing in rural areas and those in urban areas, (ii) how rural/urban composition of women within each education group changed as female education expanded and (iii) and how these two components explained stalls or

increases in teenage marriage rates for these education groups. We reject attribution of stalls or reversals in age at marriage to female education expansion if H2a, H2b or H2c are not supported.

Results

Cohort changes in MAFM and female education composition in SSA

Figure 1 shows MAFM estimates (lines/right axis scale) and female education composition (background area/left axis scale) over birth cohorts in four SSA regions. Solid lines with closed circles represent MAFM estimates for all women – i.e. MAFM at the population level. Dotted lines with star points show estimates for women with no education, dashed lines with open circles represent women with primary education and dashed lines with triangles represent women with secondary education. The background areas show the percentage of women with no education (light grey, bottom area), primary education (grey, middle area) and secondary education (dark grey, top area) for each birth cohort. Similar country-specific plots are in Appendix 3.

[Figure 1]

Our first objective is to identify regions, countries and birth cohorts over which MAFM at the population level stalled or reversed and the ages at which such stalls and reversals occurred. Thus, we first focus on MAFM estimates for all women. Figure 1 reveals that MAFM continuously increased in West Africa while it stalled over some birth cohorts in Central and East Africa and reversed in Southern Africa. In West Africa, MAFM consistently increased once it started rising, from 17.1 among women born 1960-64 to 19.4 for the 1995-99 cohort. However, the increase slowed down over the 1970-74 through 1980-84 cohorts. The slope of change over these cohorts was only 0.033 compared to 0.055 and 0.078 observed over the 1955-59 – 1970-74 and 1980-84 –

1995-99 cohorts, respectively. For Central Africa, MAFM stalled around 18.5 among women born between 1975-79 and 1985-89. It stalled after a steady increase from 15.6 among women born 1945-49 (slope = 0.095). East Africa recorded a stall in MAFM among women born 1970-74 through 1980-84, at around 18.8 years. Before stalling, MAFM had increased (slope =0.047) from 17.6 among women born 1945-49, and after the stall, it increased sharply (slope = 0.075), reaching 19.9 among women born 1995-95. In Southern Africa, MAFM reversed after reaching 25.6 among women born 1970-74 – an increase from 22.1 for the 1950-55 cohort.

Table 1 and Appendix figures 3a-3d reveal notable country heterogeneity within and across these regions in the occurrence and timing of stalls or reversals in MAFM. Specifically, Table 1 identifies countries which experienced stalls or reversals in MAFM, the birth cohorts and the ages at which such stalls/reversals occurred. It also shows the change in MAFM comparing the 1955-59 and 1990-94 birth cohorts (note the few exceptions marked by * or **).

[Table 1]

Table 1 indicates that MAFM stalled in 12 out of the 33 countries (Angola excluded), and reversed in nine countries. Countries that experienced stalls in West Africa mainly did so over the 1970-74 through 1980-84 cohorts, illustrating why the pace of increase in MAFM for the West Africa region in Figure 1 slowed down over these cohorts. The ages at which the stalls occurred in this region varies between 15.6 years in Niger and 19.6 years in Senegal. For Central Africa, the MAFM stalled in Chad and Congo (DRC) and reversed in Congo. In East Africa, MAFM either stalled or reversed in all countries except Zambian and Ethiopia. The pattern in Ethiopia could be surprising given that Bongaarts, Mensch et al. (2017) observed small period changes in age at first marriage in this country. Nevertheless, this observation re-emphasizes how period trends could

differ from cohort trends, and underscores the need to evaluate the linkage between marital timing and female education expansion from different perspectives (e.g. period vs cohort). The stalls and reversals in East African countries dominated the 1965-69 through 1985-89 birth cohorts and occurred at MAFM around 17.8-20.9. For Southern Africa, MAFM reversed in South Africa after reaching 31.1 years among women born 1975-79.

Table 1 further reveals that, despite the stalls or reversals, all countries in SSA experienced an increase in MAFM when comparing 1955-59 and 1990-94 cohorts. Nevertheless, countries that did not experience stalls or reversals in age at first marriage had, on average, a 1.6 times higher gain in MAFM. Liberia, Sierra Leone, South Africa and Rwanda are exceptional. The overall gain in MAFM in these countries is substantial despite experiencing stalls or reversals. Indeed, if we excluded these countries, the average gain in MAFM is 2.4 times higher for countries which did not experience stalls or reversals than countries where MAFM stalled or reversed.

Drivers of stalls and reversals in age at marriage in SSA

We now refer to the MAFM-education composition alignments shown in Figure 1 and Appendix 3, and the results of our decomposition analyses. Our first hypothesis (H1) was that age at marriage at the population level stalled or reversed because female education expansion dominated primary schooling, which is more compatible with early marriages. The patterns for West and East Africa in Figure 1 support this hypothesis. In West Africa, where MAFM consistently increased, female education expansion was marked by more girls' participation in secondary schooling rather than only primary schooling. The group size of women with only primary education remained constant or declined over cohorts as the proportion of women enrolling in school increased – reflecting a higher primary-to-secondary progression ratio (46.7% on average (across birth cohorts)). Furthermore, we observe compelling evidence for H1 in West Africa when considering women

born after 1975-79. The MAFM among all women increased sharply despite it stalling among women with no formal schooling and secondary education and reversing among women with primary education. This is because the proportion of girls attaining some schooling sharply increased over these cohorts, marked by more girls' participation in secondary education.

The East Africa pattern provides partial evidence for H1. MAFM at the population level stalled over the 1970-74 – 1980-84 cohorts when girls' school participation increased linearly, but was dominated by primary rather than secondary schooling. On average, the primary-to-secondary progression ratio over these cohorts was only 26.7%. Concerning marital timing within education groups, MAFM stalled for women with no education and those with primary education, while it reversed among women with secondary education. Thus, it appears that the observed stall in this region emerged from a combination of stalls in secondary education expansion and a reversal in age at marriage for the secondary educated group. Hence, suggesting partial evidence for H1. It also implies that the East Africa pattern provides partial evidence for H2, which suggested that stalls or reversals in age at marriage at the population level emerged because of within-education group reversals in marital age.

The Southern Africa pattern in Figure 1 provides compelling evidence for H2. MAFM among all women reversed over cohorts for which it declined within all specific education groups, while the proportion of women attaining primary and secondary education continued rising. Central Africa also provides some indication of evidence for H2. Here, MAFM at the population level stalled over the 1975-79 through 1985-89 cohorts when the age at marriage for the primary education group declined and that of women with secondary education generally stalled. The composition of women attaining some education increased during this stall, accompanied by an increasing proportion of women attaining secondary education.

Next, we decomposed cohort changes in teenage marriage rates into a component that is due to education-composition change, and a component due to rate changes in marital timing within specific education groups. We performed three decomposition analyses for each region, comparing the 1955-59 vs. 1970-74 cohorts, the 1970-74 vs. 1980-84 cohorts and the 1980-84 vs. 1990-94 cohorts (Figure 2). We specified these comparison cohorts (guided by the stalls and reversals in Figure 1) such that our decomposition analyses capture different phases of marital timing as female education expanded.

[Table 2a and 2b]

Tables 2a and 2b show changes in education composition and teenage marriage rates, respectively for each education group by region. As should be expected based on Figure 1, the results in Table 2a indicate larger changes in the education composition when comparing the 1955-59 vs. 1970-74 cohorts and 1980-84 vs. 1990-94 cohorts and smaller changes when comparing the 1970-74 vs. 1980-84 cohorts. The changes in marriage rates for the second and third decomposition intervals are also generally consistent with the pattern of MAFM in Figure 1.

The column panels in Figure 2 show comparison cohorts and the row panels specify the regions. We note a substantial reduction in teenage marriage rates from the 1955-59 to the 1970-74 cohorts (corresponding to the early stages of female education, particularly in West, Central and East Africa), which emerged from changes in education composition and within education group marital behaviour. However, the within-education group behaviour was more important in West and Eastern Africa. In Central and Southern Africa, changes in education composition and marital behavior within education groups were equally important.

[Figure 2]

The decomposition analyses of the1970-74 vs. 1980-84 and 1980-84 vs. 1990-94 are of particular interest as they concern cohorts over which age at marriage stalled or reversed. We note three key findings. First, the decline in marriage rates within education groups in South Africa accounted for all the reversals in age at marriage over the 1970-74 and 1980-84 cohorts (confirming H2, as noted earlier). Second, in Central and East Africa, marital behavior within education groups nearly neither contributed to a reduction nor increase in marriage rates over the 1970-74 and 1980-84 cohorts. The small observed changes in marriage rates during this interval were due to the small changes in education composition. Because the composition and the effect component are generally not offsetting each other, we can conclude that the slight reduction in teenage marriage rates in these regions, which reflect the stalls in MAFM in Figure 1, emerged from both stalls in education expansion and stalls and reversals in marital timing within specific education groups. Third, Central and East Africa had almost similar composition changes of women attaining some schooling when comparing the 1955-59 vs. 1970-74 cohorts and the 1970-74 vs. 1980-84 cohorts. However, the contribution of the composition component to the total reduction in teenage marriage rates is higher in Central Africa than in East Africa. This partially reflects the fact that attaining primary or secondary education is associated with more years of marital postponement in Central Africa than in East Africa (see Appendix 4). Nevertheless, it also reflects that Central Africa had more women progressing to secondary once enrolled in primary school than in East Africa – thus, providing partial evidence for H1.

Teenage marriage rates declined notably across all regions between the1980-84 and 1990-94 cohorts, reflecting the increase in MAFM over these birth cohorts documented in Figure 1. Figure 2 suggests that this reduction is mainly due to education composition changes. The contribution due to changes in marital timing behaviour is generally minimal in East and Southern

Africa regions. In West and Central Africa, changes in marital timing behaviour within education groups offset the contribution of changes in education composition. We refer to this observation later when we discuss H2a.

In summary, Figure 1 and Figure 2 indicate that West Africa supports H1, Southern Africa supports H2, and Central and East Africa support both H1 and H2. Table 3 classifies countries which experienced stalls or reversals according to whether they provide evidence for H1, H2 or both H1 and H2. We find that 15 of the 21 countries that experienced stalls or reversals did so in part (6) or solely (9) because marital age reversed within specific education groups.

[Table 3]

Stalls and reversals in MAFM and female education expansion

We now assess whether stalls and reversals within specific education groups are attributable to conditions associated with female education expansion. We hypothesized that if this is the case, then stalls or reversals in age at marriage for specific education groups occurred over cohorts which experienced a substantial increase in girls' school participation (H2a).

The pattern in Figure 1 provides mixed findings concerning this proposition. On the one hand, stalls or reversals in age at marriage for the primary or secondary education groups did not always coincide with a substantial increase in girls' school participation. For example, in East Africa, age at marriage reversed among women with secondary education over the 1970–74 and 1980–84 cohorts when the size of this group varied between 18.3% and 21.4%. However, it rose sharply following the 1980–84 birth cohort in parallel with a marked increase in the proportion of girls attaining this level of education. We noted a parallel pattern in Central Africa and countries such as Burkina Faso, Kenya, Madagascar and Uganda. Similarly, in Southern Africa, the reversals

in age at marriage within specific education groups emerged before the sharp increase in the composition of women with secondary education (beginning with the 1980–84 cohort).

On the other hand, in countries such as Chad, Comoros, Congo, Malawi and Nigeria, the reversals in age at marriage for the specific education group (particularly the secondary education) coincided with a substantial increase in girls' school participation, thus supporting H2a. Moreover, the West Africa region pattern in Figure 1 also provides evidence for H2a. The stalls and reversals in age at marriage for the primary and secondary education group in this region occurred as female education sharply expanded (1980-84 - 1995-99 cohorts). Nonetheless, the overall MAFM increased despite these education-specific MAFM stalls. This pattern implies that the magnitude of female education expansion over these cohorts did not yield its anticipated maximum effect on reducing early marriages. Indeed, the effect component for the decomposition of marriage rates between the 1980-84 and 1990-94 cohorts is positive and offsets the composition component. This West African region pattern is apparent in several countries (see list under Table 4).

We considered countries where the MAFM for the primary or secondary education group stalled or reversed as girls' school participation increased to evaluate H2b and H2c (see list under Table 4). The idea is that if these reversals are connected to female education expansion conditions, then (i) they are likely steeper among women from rural areas constituting these groups (H2b); and (ii) that these education groups become less selected (reflected by increasing proportion of women from rural areas) as girls school participation increased, resulting in stalls or reversals in marital timing in these education groups (H2c). We pooled all eligible countries and performed a single decomposition analysis for each education group – comparing the 1975–79 vs. 1990-94 cohort. We consider these comparison cohorts because female education in SSA expanded sharply, mainly following the 1975–79 cohort (see Appendix 3).

[Table 4]

Table 4 shows changes in teenage marriage rates and rural/urban composition between the 1975–79 and 1990–94 cohorts within each education group. Consistent with H2b, we find that among women with primary education, the increase in teenage marriage rate is 10.6 times higher for women from rural areas compared to their counterparts from urban areas. For women with no education and secondary education, the teenage marriage rate increased among women from rural areas (by 11% and 2%, respectively). In comparison, it decreased among women from urban areas (by 0.9% and 10.8%, respectively).

[Figure 3]

Concerning composition changes, we find marginal increases in the proportion of women from rural areas across all the education groups – the maximum is 7.2% for the secondary group. The area of residence in DHS data refers to residence status at the time of survey. Thus it does not fully capture the extent to which rural-urban representation changed within specific education groups because women who attended school in rural areas may migrate to urban areas to seek job opportunities or because of marriage (Mercandalli, Losch et al. 2019). Nevertheless, we find that the changes in the rural-urban composition within each education group partly explain the observed stalls and reversals in age at marriage. For the primary education group, 10% of the increase in teenage marriage rates was due to the increase in the proportion of women from rural areas. Among women with secondary education, 39.4% of the reduction in teenage marriage rates due to changing marital timing behaviour (mainly among women in urban areas) was offset by the increase in the proportion of women from rural areas. The results in Table 4 and Figure 3, thus, provide evidence that stalls or reversals in age at marriage that emerged as girls' school participation increased are linked to conditions associated with female education expansion.

Discussion and Conclusion

This paper extends the discussion of the paradox of stalls and reversals in the timing of first marriage despite female education expansion in SSA. We performed a systematic investigation of this paradox in four broad SSA regions (West, Central, East and Southern Africa), and 33 individual countries using DHS data collected between 1986 and 2022. Our aim was (i) to identify regions, countries and birth cohorts over which the age at first marriage at the population level stalled or reversed and the ages at which such stalls or reversals occurred; (ii) to describe conditions that gave rise to such stalls or reversals. We calculated MAFM for specific education groups and all women for five-year birth cohorts of women born between 1945 and 1999 and performed decomposition analyses of cohort changes in marriage rates to address these objectives.

Concerning the first objective, we found that the population-level MAFM stalled in 12 countries and reversed in nine countries. At the regional level, MAFM stalled in Central and East Africa, reversed in Southern Africa, and continuously increased in West Africa. These stalls and reversals generally dominated the 1965-69 through 1985-89 birth cohorts. They occurred at different MAFM thresholds (15.6-31.1) – generally reflecting the heterogeneity of marital timing behavior in SSA. Given the dominancy of early marriages in this region, particularly in West, Central and East Africa, this observation implies that stalls and reversals in MAFM meant retardation of progress in efforts to alleviate early marriages. The decomposition results indeed revealed minimal decrease or increases in teenage marriage rates over cohorts for which MAFM stalled or reversed.

For the second objective, we observed that six countries that experienced stalls or reversals in MAFM did so because female education expansion dominated primary education. This confirms

H1, the incompatibility hypotheses, which proposed that marital ages stalled because education expansion was concentrated in the primary school sector. However, nine countries supported our alternative hypothesis (H2), which suggested that stalls or reversals emerged because age at marriage within specific education groups reversed. Six countries revealed evidence in support of both H1 and H2. At the reginal level, West Africa revealed evidence in favor of H1; Southern Africa supported H2, while Central and East Africa supported both H1 and H2. These results illustrate the diversity of the relationship between marital timing and female education expansion in this region noteworthy for policies and programs aiming at reducing early marriages in SSA.

Notwithstanding the evidence for H2, the findings suggested that the slow pace of progress for girls' participation in secondary schooling is the critical condition for stalls or reversals to emerge at the population level. At the regional level, this finding is more apparent in West Africa among women born after 1980–84. Age at marriage stalled for women with no formal schooling and those with secondary education and reversed among women with primary education. However, MAFM at the population level increased, primarily because the proportion of women who attended secondary education rose markedly, and the education gradient in age at marriage was huge (see appendix 4). In contrast, in East Africa, for example, marital timing for specific education groups stalled over the 1970-74 –1980-84 cohorts, for which the composition of women attaining secondary education stagnated, while those attending primary education increased. These findings confirm that changes in female education composition are critical in shaping population-level marital timing trajectories (Bongaarts, Mensch et al. 2017). However, our results illustrate that the change in the composition of women with secondary education rather than primary education matters most.

Previous research argued that stalls or reversals in age at marriage in SSA could be linked to conditions associated with female education expansion –i.e. poor quality of education, changes in age pattern of school enrolment and completion, and loss of selectivity (Grant 2015, Bongaarts, Mensch et al. 2017). We evaluated three hypotheses to consider whether the stalls or reversals we identified within specific education groups are attributable to conditions associated with female education expansion. We suggested that if this is true then stalls and reversals within education groups emerged over cohorts for which girls' school participation increased substantially. The results revealed that not all stalls or reversals in SSA are attributable to female education expansion. In some regions, they emerged before girls' school participation had increased substantially; in others, they did not occur as girls' school participation expanded sharply. At the regional level, this pattern is apparent in Central and East Africa, where MAFM within education groups (particularly secondary education groups) rose sharply following the 1980-84 cohort as girls' school participation increased.

Women born after 1980–84 presumably benefitted the most from policies that promoted girls' school participation in the early 1990s. In extension, they probably experienced the most deterioration in education quality due to rapid school influxes(Bold, Filmer et al. 2017, Filmer, Rogers et al. 2020, Evans and Mendez Acosta 2021), the most improvements in early school enrolment and grade progression rates (Ndaruhutse 2008, Lucas and Mbiti 2012, Grant 2015, World Bank 2020) and limited employment opportunities outside the family (Al-Samarrai and Bennell 2007, Filmer and Fox 2014). Thus, the pattern in Central and East Africa illustrate that even though rapid education expansion has downsides, it is not inevitably linked with stalls or reversals in marital age.

Nonetheless, where stalls or reversals coincided with substantial increases in girls' school participation, we found evidence suggesting that these two are connected. Within each education group, we observed more significant increases in teenage marriage rates among women from rural areas compared to their counterparts from urban areas. This finding confirmed our anticipation (H2b) that if reversals within education groups were linked to female education expansion then they were more likely steeper in rural than urban areas. We also observed evidence for H2c – noting that the proportion of women from rural areas constituting each education group increased as girls' school participation rose, which partially explained stalls and reversals in age at marriage within these groups. We attempted to examine how diminishing selectivity of education groups was linked to marital timing stalls or reversals during education expansion via examining the link between rural/urban composition changes and marital timing changes within each education group. As we noted, the rural/urban composition indicator is likely limited in fully capturing urban/rural origins and as a measurement of selectivity as such. We therefore believe we did not fully capture the changes in selectivity of the composition of women constituting each education group. Nevertheless, the marginal rural/urban composition changes we observed provided useful insights. Further studies that consider how marital timing changes in SSA are connected to changes in the timing of school enrolment and completion, skills acquired in school, and female employment opportunities could provide further insights into this subject.

The findings presented in this paper re-emphasizes the need to expand female education beyond primary school to ensure meaningful reductions in early marriages in SSA. Thus, the dynamics of female education expansion we documented in West, Central and East Africa suggest different policy and programme needs for these regions. In West Africa, enrolment in primary school is a critical challenge. The primary-to-secondary progression ratio is relatively higher in

this region, although there is room for improvement. On the other hand, enrolment in a primary school is now nearly universal in East Africa. It is, instead, getting girls beyond primary education which is a significant challenge. The Central Africa pattern falls between that of West and East Africa. Policies that tailor primary and secondary school enrollment to the conditions and needs of each specific region will likely be more successful in facilitating the reduction of teenage marriages and, in turn, ensuring the advancement of females' socioeconomic and reproductive health in SSA.

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Table 1: Identification of stalls and reversals in median age at first marriage at the population level in 33 sub-Saharan African countries

Region and country	MAFM 1955-59	Onset of increase	Stalled/Reversed	Interval of stalls/reversals	MAFM at stalls/reversals (slope)	MAFM 1990-94	MAFM change 1955-59 - 1990-94
West Africa	**17.1**	**1960-64**	-	-	-	**19.0**	**1.9**
Benin	18.7	AR	Stalled	1965-69 - 1980-84	19.0 (0.010)	19.4	0.8
Burkina Faso	17.5	1975-79	Stalled	1980-84 - 1990-94	17.8 (-0.008)	17.7	0.2
Cote d'Ivoire	17.8	1965-69	-	-	-	20.2	2.3
Gambia	17.3*****	AR	-	-	-	19.8	2.5
Ghana	18.7	AR	-	-	-	23.5	4.8
Guinea	16.0	AR	-	-	-	17.8	1.8
Liberia	17.5	AR	Stalled	1960-64 - 1970-74	18.3 (0.008)	21.0	3.5
Mali	16.2	AR	-	-	-	17.3	1.2
Niger	15.0	AR	Stalled	1970-74 - 1980-84	15.6 (0.008)	15.9	0.9
Nigeria	16.2	1960-64	Stalled	1980-84 - 1995-99	18.1 (-0.005)	18.1	1.9
Senegal	16.7	AR	Stalled	1975-79 - 1985-89	19.6 (-0.005)	20.1	3.4
Sierra Leone	17.3*****	AR	Stalled	1970-74 - 1980-84	18.0 (-0.008)	19.3	2.0
Togo	18.4	AR	-	-	-	20.6	2.2
Central Africa	**16.9**	**AR**	Stalled	1975-79 -1985-89	18.5 (0.008)	**18.7**	**1.8**
Angola	20.4*	na	na	na	na	20.5	0.1
Cameroon	17.0	AR	-	-	-	19.2	2.2
Chad	15.8	AR	Stalled	1975-79 - 1990-94	16.0 (0.003)	16.2	0.4
Congo	18.9	AR	Reversed	1975-79 - 1990-94	20.3 (-0.073)	19.2	0.3
Congo (DRC)	17.5	AR	Stalled	1970-74 - 1985-89	18.6 (0.003)	18.9	1.4
Gabon	19.0	AR	-	-	-	21.3	2.3

Table 1 Continued

Region and country	MAFM 1955-59	Onset of increase	Stalled/Reversed	Interval of stalls/reversals	MAFM at stalls/reversals (slope)	MAFM 1990-94	MAFM change 1955-59 - 1990-94
East Africa	**17.8**	**AR**	Stalled	1975-79 - 1985-89	18.8 (0.008)	**19.7**	**1.8**
Burundi	19.4	1960-64	Reversed	1965-69 - 1985-89	20.6 (-0.023)	20.4	1.0
Comoros	18.2	AR	Reversed	1975-79 - 1990-94	20.9 (-0.022)	20.5	2.3
Ethiopia	15.7	1965-69	-	-	-	18.3	2.7
Kenya	18.3	AR	Reversed	1975-79 - 1985-89	20.0 (-0.025)	20.3	2.0
Madagascar	18.3	AR	Reversed	1965-69 - 1985-89	18.1 (-0.083)	18.8	0.5
Malawi	17.4	1960-64	Stalled	1970-74 - 1985-89	17.9 (-0.002)	18.2	0.8
Mozambique	17.0	AR	Stalled	1960-64 - 1980-84	17.8 (0.008)	17.9	0.9
Rwanda	20.2	AR	Reversed	1965-69 - 1975-79	21.1 (-0.042)	23.4	3.3
Tanzania	17.3	AR	Stalled	1975-79 - 1985-89	19.0 (0.008)	19.6	2.3
Uganda	17.1	AR	Reversed	1965-69 - 1975-79	17.8 (-0.017)	18.8	1.7
Zambia	17.0	AR	-	-	-	19.5	2.5
Zimbabwe	18.6	1965-69	Reversed	1970-74 - 1990-94	18.1 (-0.027)	19.0	0.4
Southern Africa	**22.1**	**1960-64**	Reversed	1970-74 - 1985-89	25.6 (-0.055)	**24.9****	**2.8**
Lesotho	18.2	AR	-	-	-	20.5**	2.3
Namibia	24.4	AR	-	-	-	30.0**	5.6
South Africa	23.0	AR	Reversed	1975-79 - 1985-89	31.1 (-0.025)	30.6**	7.6

NOTES:

1. MAFM = Mean age at first marriage.
2. * = estimate not corresponding to the 1955-59 birth cohort. Gambia's estimate is for the 1965-69 cohort, Sierra Leone's estimate is for the 1960-64 cohort, and Angola's estimate is for the 1965-69 cohort
3. ** = estimate not corresponding to 1990-94 birth cohort. Namibia's estimate is for the 1980-84 cohort, while the other estimates are for the 1985-89 cohort
4. AR = MAFM was **a**lready **r**ising over the early birth cohorts – i.e. at least for the first three earliest available birth cohorts.
5. In Comoros, MAFM did not consistently decline. Instead, there was a sharp drop between 1975-79 and 1980-84 after consistently increasing for the birth cohorts 1950-54 through 1975-79. The recent birth cohorts estimate (1985-89 and 1990-94) are below that of 1975-79 and are consistent with the 1980-84 birth cohort. Thus, we still conclude that the age at first marriage reversed in this country, although the pattern does not fit our evaluation criteria.
6. Estimate of the threshold at which MAFM stalled is not the exact estimate; it should read MAFM stalled around the estimate in question. For example, in Malawi, MAFM stalled around 17.9.
7. We do not evaluate stalls/reversals for Angola because its estimates are only based on single DHS. However, its data is included in calculating estimates for Central Africa.

Table 2a: Changes in teenage marriage rates (per 1000 women) between comparison cohorts according to the level of education in four SSA regions

	First decomposition			Second decomposition			Third decomposition		
	1955-59	1970-74	Diff	1970-74	1980-84	Diff	1980-84	1990-94	Diff
West Africa									
All women	***109.5***	***90.4***	***-19.1***	***90.4***	***82.8***	***-7.6***	***82.8***	***72.0***	***-10.8***
No education	120.7	107.7	-13.0	107.7	106.9	-0.8	106.9	109.8	2.9
Primary	92.5	75.2	-17.3	75.2	68.2	-7.0	68.2	76.4	8.2
Secondary	57.4	44.6	-12.8	44.6	35.3	-9.3	35.3	34.6	-0.7
Central Africa									
All women	***108.7***	***84.4***	***-24.3***	***84.4***	***81.8***	***-2.6***	***81.8***	***76.5***	***-5.3***
No education	140.2	121.8	-18.4	121.8	121.7	-0.1	121.7	125.1	3.4
Primary	101.6	87.3	-14.2	87.3	89.6	2.3	89.6	94.8	5.2
Secondary	55.8	54.5	-1.3	54.5	53.6	-0.9	53.6	47.5	-6.1
East Africa									
All women	***95.9***	***78.4***	***-17.5***	***78.4***	***76.2***	***-2.1***	***76.2***	***63.9***	***-12.3***
No education	108.8	98.7	-10.2	98.7	99.8	1.1	99.8	99.6	-0.2
Primary	94.9	82.5	-12.4	82.5	80.3	-2.1	80.3	79.8	-0.6
Secondary	51.3	42.9	-8.4	42.9	46.4	3.5	46.4	36.0	-10.4
Southern Africa									
All women	***41.9***	***29.4***	***-12.5***	***29.4***	***32.3***	***2.9***	***32.3***	***24.0***	***-8.3***
No education	51.5	38.6	-12.9	38.6	51.6	12.9	51.6	26.5	-25.1
Primary	52.7	48.3	-4.4	48.3	56.3	8.1	56.3	60.8	4.5
Secondary	25.3	18.8	-6.5	18.8	20.4	1.6	20.4	17.3	-3.0

Table 2b: Changes in education composition (% with no education, % with primary and % with secondary education) between comparison cohorts in four SSA regions

	First decomposition			Second decomposition			Third decomposition		
	1955-59	1970-74	Diff	1970-74	1980-84	Diff	1980-84	1990-94	Diff
West Africa									
No education	75.7	66.5	-9.2	66.5	61.9	-4.5	61.9	45.1	-16.9
Primary	16.3	19.5	3.2	19.5	18.8	-0.6	18.8	18.2	-0.6
Secondary	8.1	14.0	6.0	14.0	19.2	5.2	19.2	36.8	17.5
Central Africa									
No education	49.8	33.1	-16.7	33.1	28.0	-5.1	28.0	24.8	-3.2
Primary	33.1	32.6	-0.5	32.6	33.8	1.1	33.8	29.1	-4.7
Secondary	17.1	34.3	17.2	34.3	38.3	4.0	38.3	46.1	7.9
East Africa									
No education	46.2	28.4	-17.8	28.4	23.2	-5.2	23.2	13.3	-9.9
Primary	44.2	53.3	9.1	53.3	55.4	2.1	55.4	49.0	-6.5
Secondary	9.7	18.3	8.7	18.3	21.4	3.1	21.4	37.8	16.3
Southern Africa									
No education	15.1	5.6	-9.4	5.6	3.4	-2.3	3.4	1.0	-2.4
Primary	48.7	34.1	-14.6	34.1	32.6	-1.5	32.6	17.0	-15.6
Secondary	36.3	60.2	24.0	60.2	64.1	3.8	64.1	82.0	18.0

Table 3: Classification of countries which experienced stalls or reversals in MAFM at the population level, according to whether they provide evidence for H1, H2 or both H1 and H2

H1	**H2**		**Both H1 and H2**
Stalls or reversals emerged because education expansion dominated primary education	Stalls or reversals emerged because age at first marriage within primary or secondary education groups reversed.		Stalls or reversals emerged from a combination of H1 and H2
Benin	Burkina Faso	Uganda	Burundi
Liberia	Nigeria	Zimbabwe	Kenya
Niger	Chad	South Africa	Madagascar
Sierra Leone	Congo		Mozambique
Congo (DRC)	Comoros		Senegal
Tanzania	Malawi		Rwanda

Table 4: Changes in the teenage marriage rate and rural/urban composition, according to the level of education, comparing the 1975-79 and 1990-94 birth cohorts.

	Teenage marriage rate change (per 1000 women)			Rural/Urban composition change (per cent)		
	1975-79	1990-94	Change	1975-79	1990-94	Change
No education						
Total	105.1	114.4	9.3	-	-	-
Rural	111.6	123.9	12.3	76.4	78.0	1.6
Urban	85.9	85.1	-0.8	23.6	22.0	-1.6
Primary						
Total	73.2	82.5	9.3	-	-	-
Rural	84.7	98.5	13.8	57.9	61.5	3.6
Urban	58.7	60.0	1.3	42.1	38.5	-3.6
Secondary						
Total	39.6	38.5	-1.1	-	-	-
Rural	47.7	48.7	1.0	33.8	41.0	7.2
Urban	35.6	31.8	-3.9	66.2	59.0	-7.2

Notes:

1. The analysis includes countries where MAFM within specific education groups stalled or reversed as the proportion of women attaining some schooling increased substantially following the 1975-79 birth cohort.
2. Countries include Benin, Chad, Comoros, Congo, Madagascar, Mali, Mozambique, Nigeria, Senegal, and Togo.
3. Some of the countries included for this analysis supports H1; it only implies that the stalls or reversals occurred way before substantial female education expansion; and that MAFM within specific education groups stalled or reversed when female education expanded substantially, but did not translate into stalls at the population level – i.e. the composition effect outweighed the behaviour effect. Similarly, some countries included in this analysis did not experience stalls or reversals at the population level. However, age at marriage stalled or reversed within specific education groups as girls' school participation increased substantially.

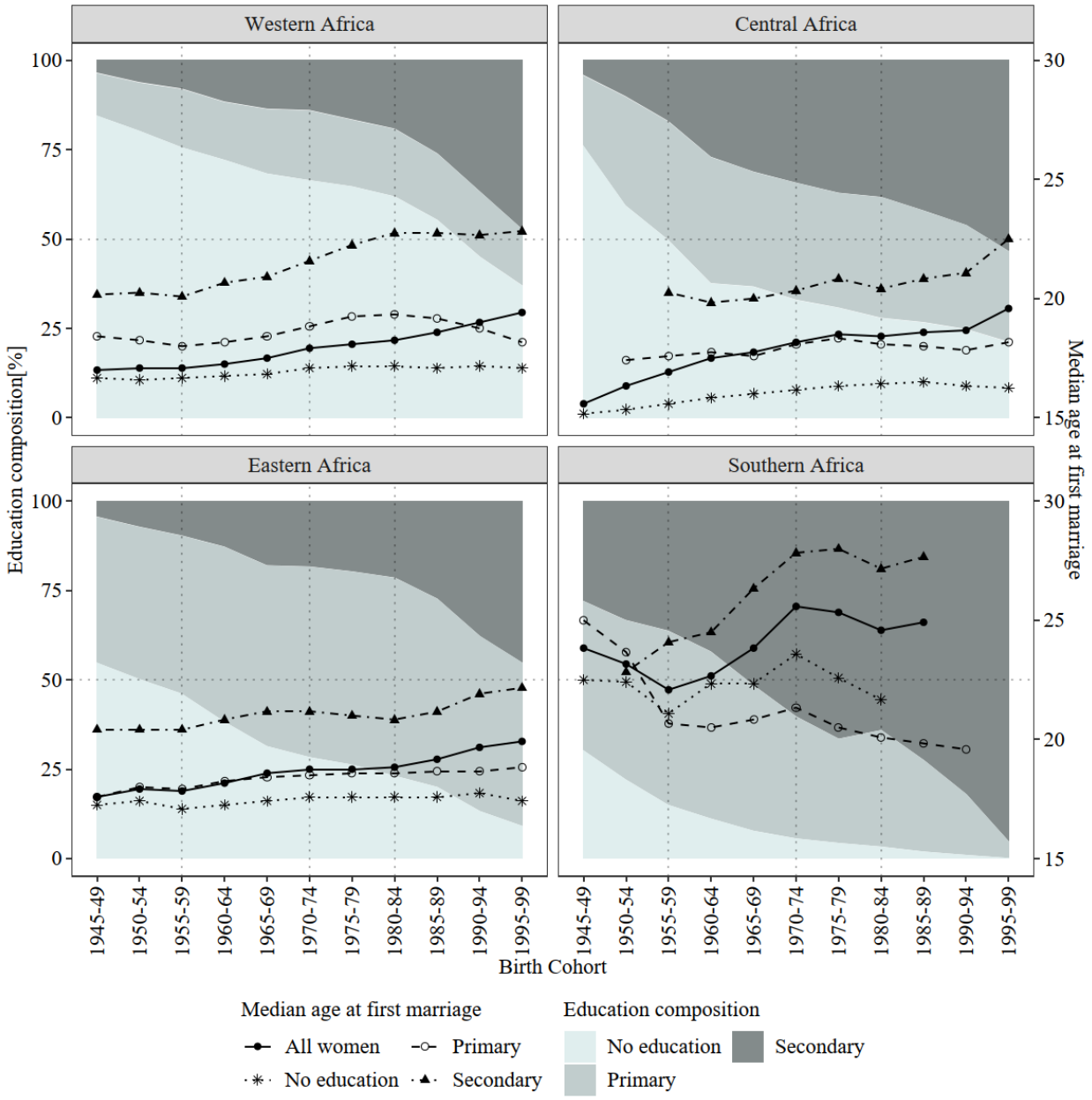


Figure 1: Cohort changes in median age at first marriage (according to the level of education) and in education composition (% with no education, % with primary, and % with secondary education) in four sub-Saharan Africa regions.

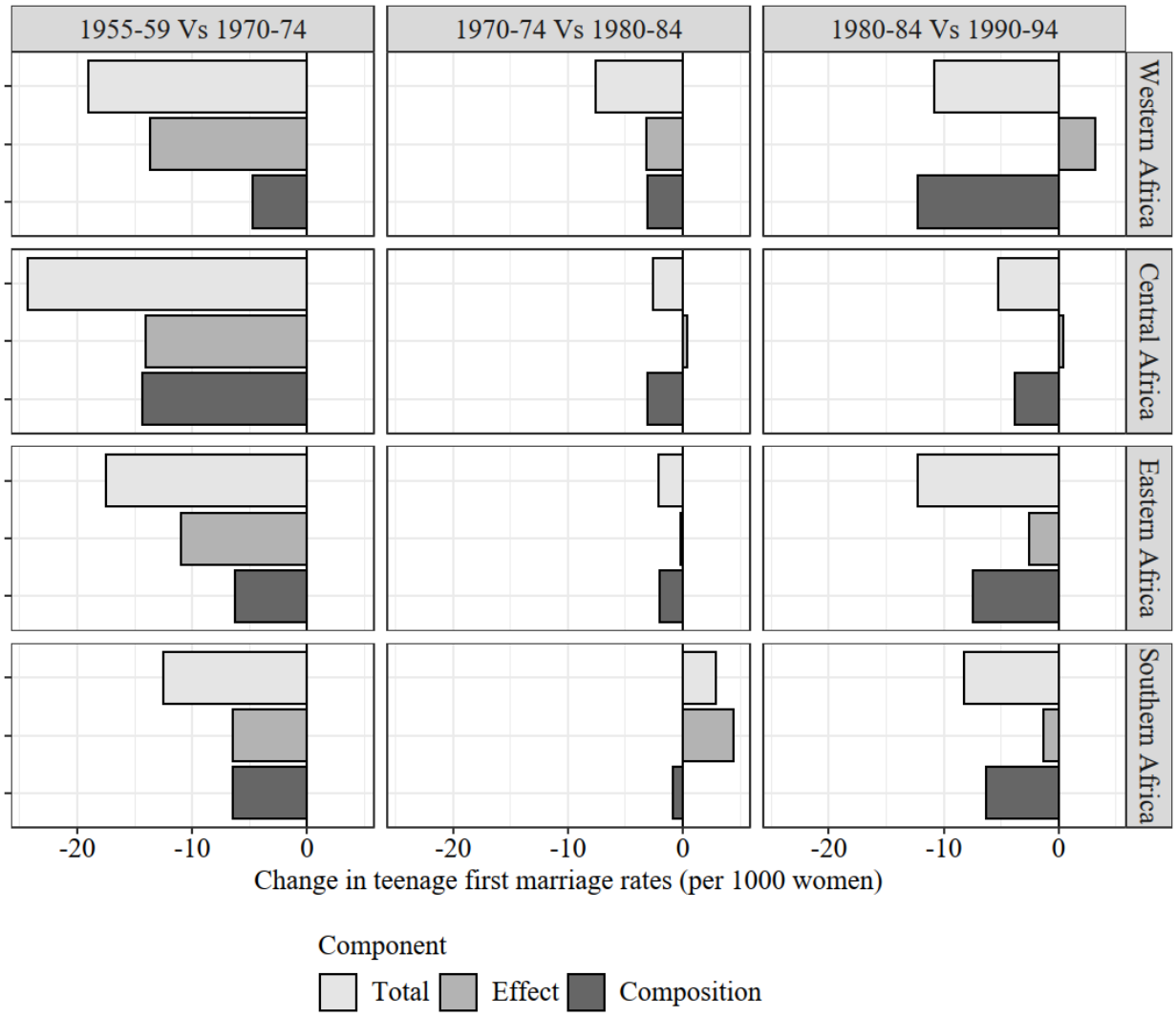


Figure 2: Contribution of changes in education composition (composition component) and marital timing behaviour within specific education groups (effect component) to the total change in teenage marriage rates, comparing 1955-59 vs 1970-74, 1970-74 Vs 1980-84 and 1980-84 Vs 1990-94 birth cohorts, in four sub-Saharan Africa regions

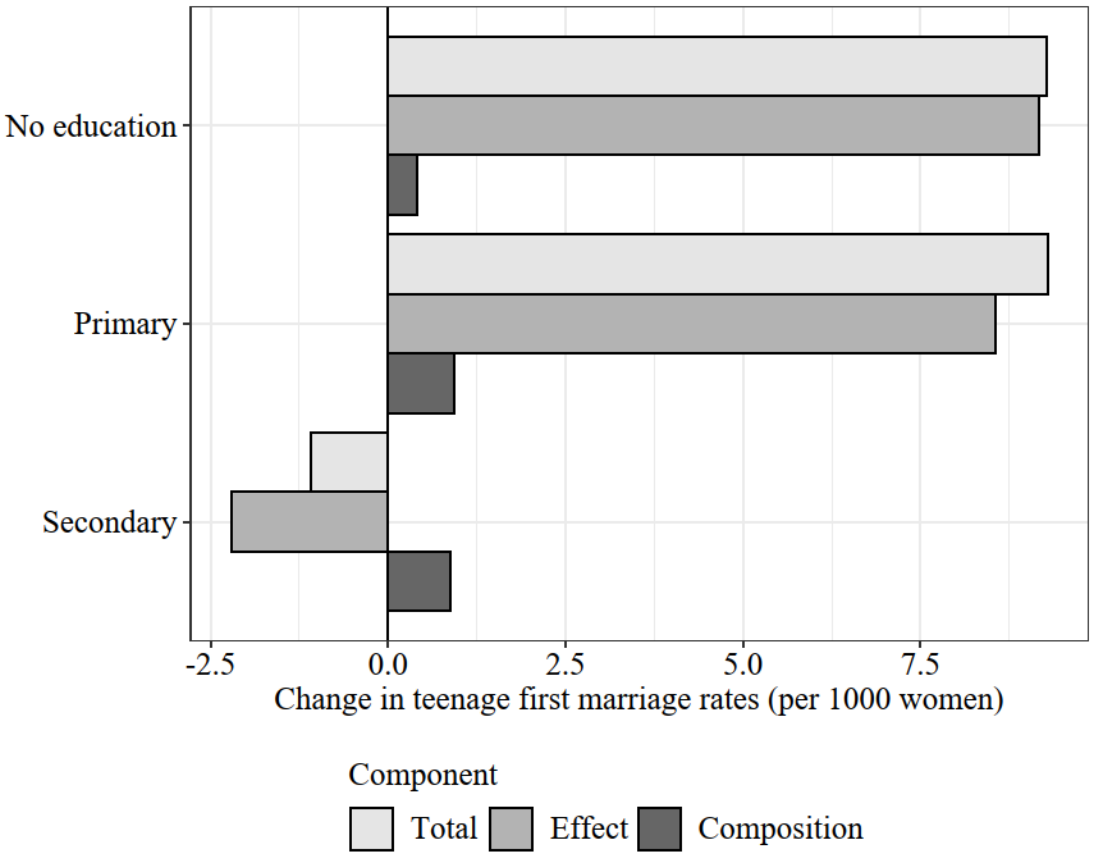


Figure 3: Contribution of changes in rural/urban composition (composition component) and marital timing behaviour among women from rural and urban areas to the total change in teenage marriage rates, comparing 1975-79 vs 1990-94 birth cohorts, for each education group

Notes:

1. Same notes as for Table 4

Appendix 1: Distribution of primary analytical sample according to birth cohort, classified by region and country

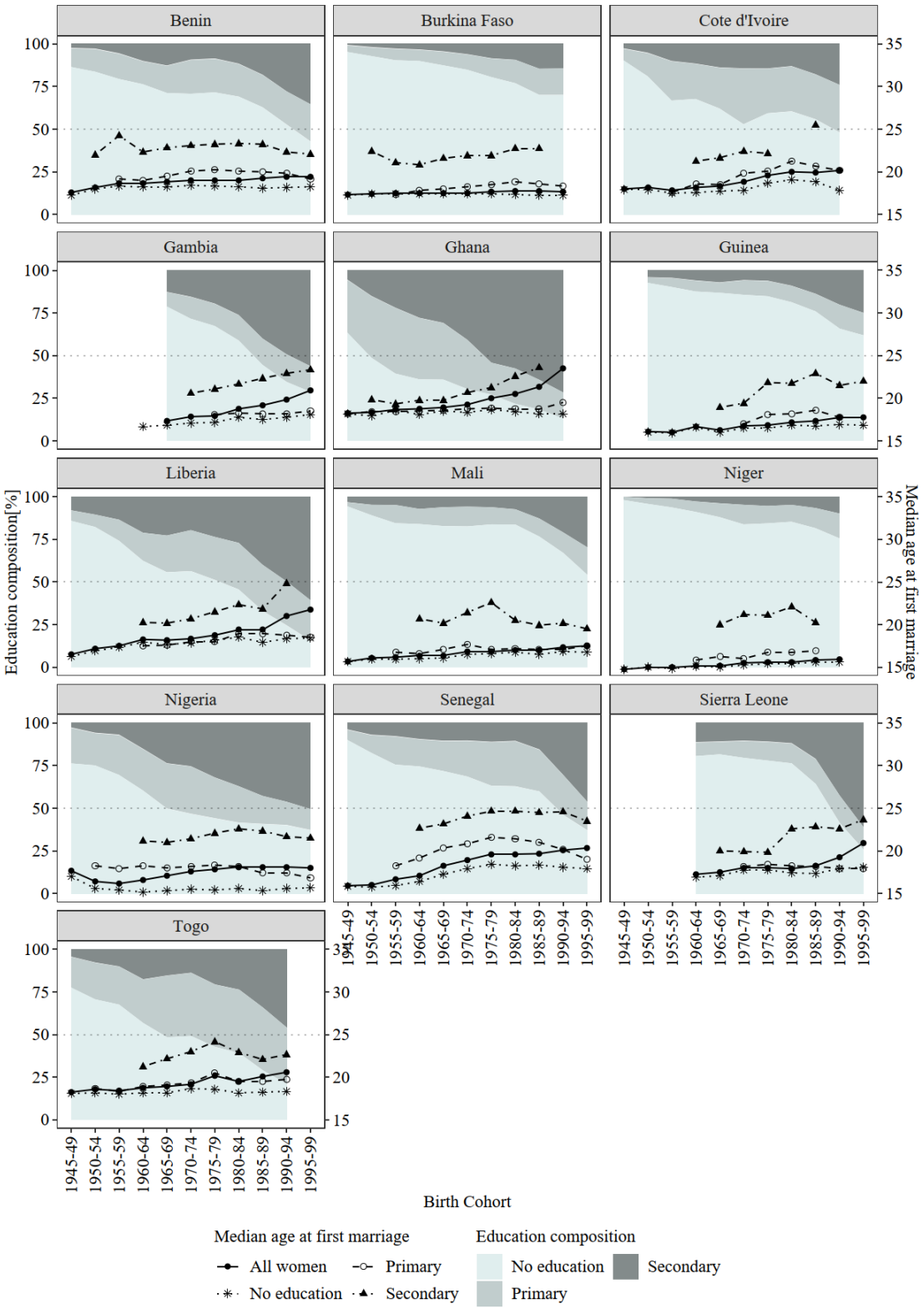
Region and Country	Sample size by birth cohort											Total
	1945-49	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	
Western Africa	**5,588**	**11,317**	**20,541**	**36,672**	**52,091**	**68,482**	**71,775**	**78,280**	**68,275**	**49,701**	**20,949**	**483,671**
Benin	306	690	1,799	3,262	5,149	7,693	8,747	9,142	6,790	4,161	1,946	49,685
Burkina Faso	493	1,249	2,491	4,175	4,960	5,583	5,313	4,755	3,167	747	0	32,933
Cote d'Ivoire	506	790	1,018	1,864	2,564	3,021	1,800	1,640	1,890	963	0	16,056
Gambia	0	0	0	141	586	1,521	2,076	2,990	3,174	3,470	1,843	15,801
Ghana	839	1,448	2,334	3,311	4,174	4,027	3,505	2,788	2,052	1,449	1	25,928
Guinea	5	549	1,176	1,929	2,905	4,252	4,481	3,890	3,165	2,744	1,291	26,387
Liberia	537	618	1,284	1,871	1,840	2,639	3,035	3,706	3,092	2,293	1,339	22,254
Mali	462	1,418	2,736	4,353	5,925	7,278	7,463	6,891	4,580	3,253	1,520	45,879
Niger	491	1,159	1,800	3,144	4,283	4,227	4,086	3,934	2,821	1,182	0	27,127
Nigeria	678	1,096	2,129	6,047	8,656	12,043	13,461	16,926	15,655	11,093	5,106	92,890
Senegal	818	1,264	2,411	3,894	6,331	9,927	10,828	14,204	14,881	12,435	5,524	82,517
Sierra Leone	0	0	54	813	1,902	3,832	4,602	5,985	5,395	4,637	2,379	29,599
Togo	453	1,036	1,309	1,868	2,816	2,439	2,378	1,429	1,613	1,274	0	16,615
Central Africa	**549**	**1,535**	**4,079**	**7,346**	**12,996**	**16,334**	**19,238**	**19,801**	**17,732**	**13,604**	**2,647**	**115,861**
Angola	0	0	0	0	617	987	1,561	1,537	2,355	2,758	761	10,576
Cameroon	360	742	1,725	2,862	3,839	4,957	5,340	5,778	4,436	3,230	1,708	34,977
Chad	189	542	1,255	1,375	3,059	3,608	3,991	3,508	3,248	3,034	178	23,987
Congo	0	0	325	1,024	1,656	2,211	2,627	3,143	1,980	740	0	13,706
Congo (DRC)	0	0	313	1,068	2,210	2,836	3,617	4,447	4,400	3,069	0	21,960
Gabon	0	251	461	1,017	1,615	1,735	2,102	1,388	1,313	773	0	10,655

Appendix 1 Continued

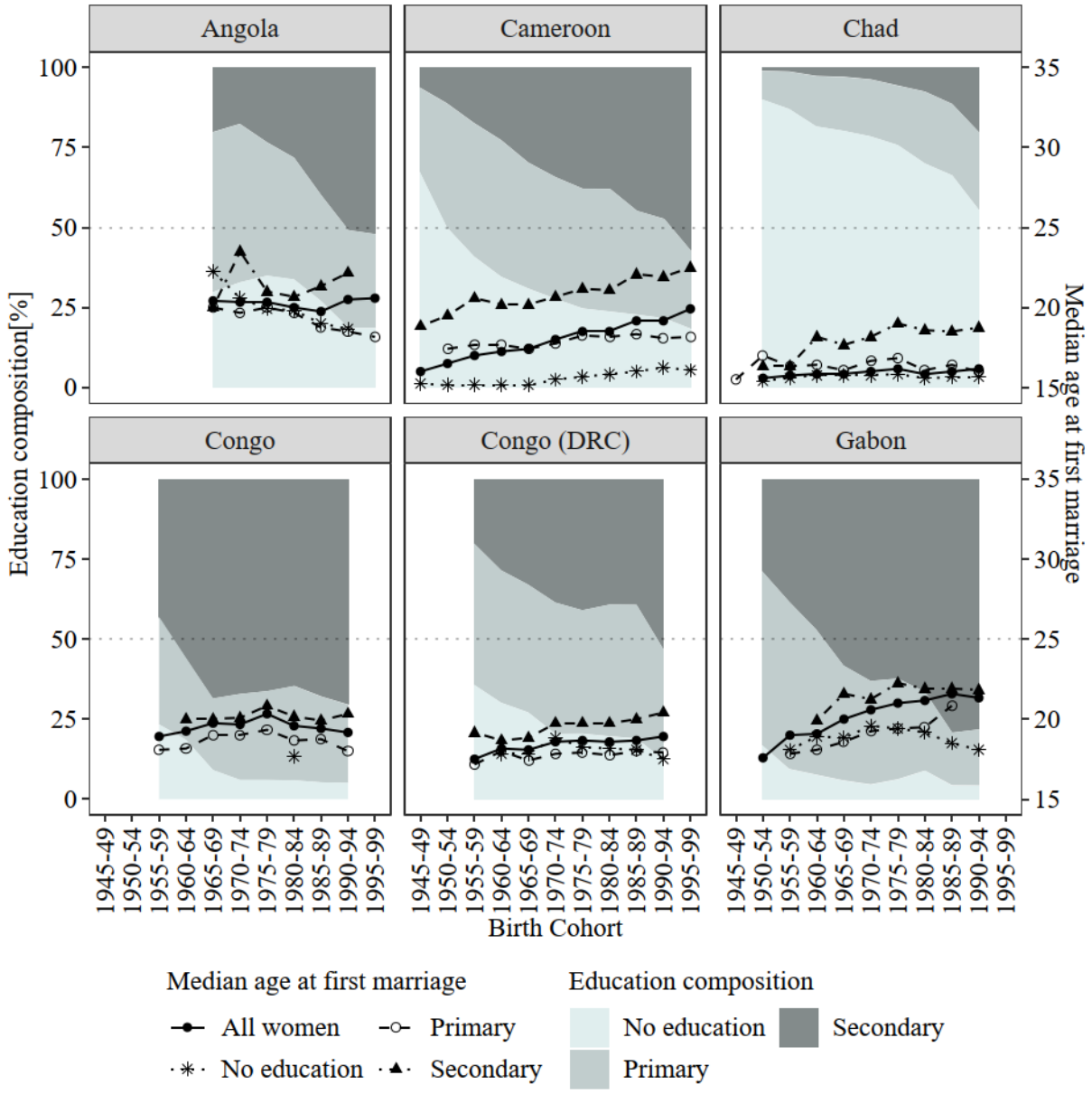
Region and Country	Sample size by birth cohort											Total
	1945-49	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	
Eastern Africa	**6,745**	**14,225**	**24,501**	**41,013**	**54,517**	**69,479**	**71,767**	**69,963**	**56,457**	**39,034**	**13,148**	**460,849**
Burundi	380	492	733	1,314	1,747	2,409	2,575	3,795	4,269	3,655	1,381	22,750
Comoros	113	216	310	462	705	1,078	772	732	713	574	0	5,675
Ethiopia	0	1,086	2,097	3,323	4,916	6,956	8,771	7,431	5,958	3,547	936	45,021
Kenya	1,300	2,189	3,245	4,975	7,357	7,271	6,958	6,518	6,470	4,547	0	50,830
Madagascar	572	1,259	2,295	4,033	4,743	5,995	6,269	5,883	4,497	2,735	3,091	41,372
Malawi	376	1,240	2,187	4,544	6,044	8,646	10,635	11,109	8,150	5,304	1,179	59,414
Mozambique	274	831	1,828	3,030	3,758	4,766	5,079	4,204	2,397	894	0	27,061
Rwanda	476	1,226	2,513	4,199	5,328	7,373	7,889	9,060	7,019	4,967	2,292	52,342
Tanzania	1,044	1,848	2,714	4,695	6,240	7,212	6,085	5,248	3,837	2,509	594	42,026
Uganda	617	1,202	2,147	3,650	4,869	6,114	5,585	5,261	4,731	3,722	1,302	39,200
Zambia	807	1,251	2,201	3,409	4,863	6,698	6,383	6,000	4,903	4,582	2,062	43,159
Zimbabwe	786	1,385	2,231	3,379	3,947	4,961	4,766	4,722	3,513	1,998	311	31,999
Southern Africa	**625**	**1,890**	**3,305**	**5,308**	**7,383**	**8,324**	**8,472**	**7,551**	**5,817**	**3,586**	**437**	**52,698**
Lesotho	0	0	565	1,310	1,812	2,033	2,545	3,352	2,413	1,196	2	15,228
Namibia	405	851	1,479	2,477	3,506	3,858	3,706	3,113	2,205	1,172	0	22,772
South Africa	220	1,039	1,261	1,521	2,065	2,433	2,221	1,086	1,199	1,218	435	14,698

Appendix 2: Proportion married by age according to birth cohort

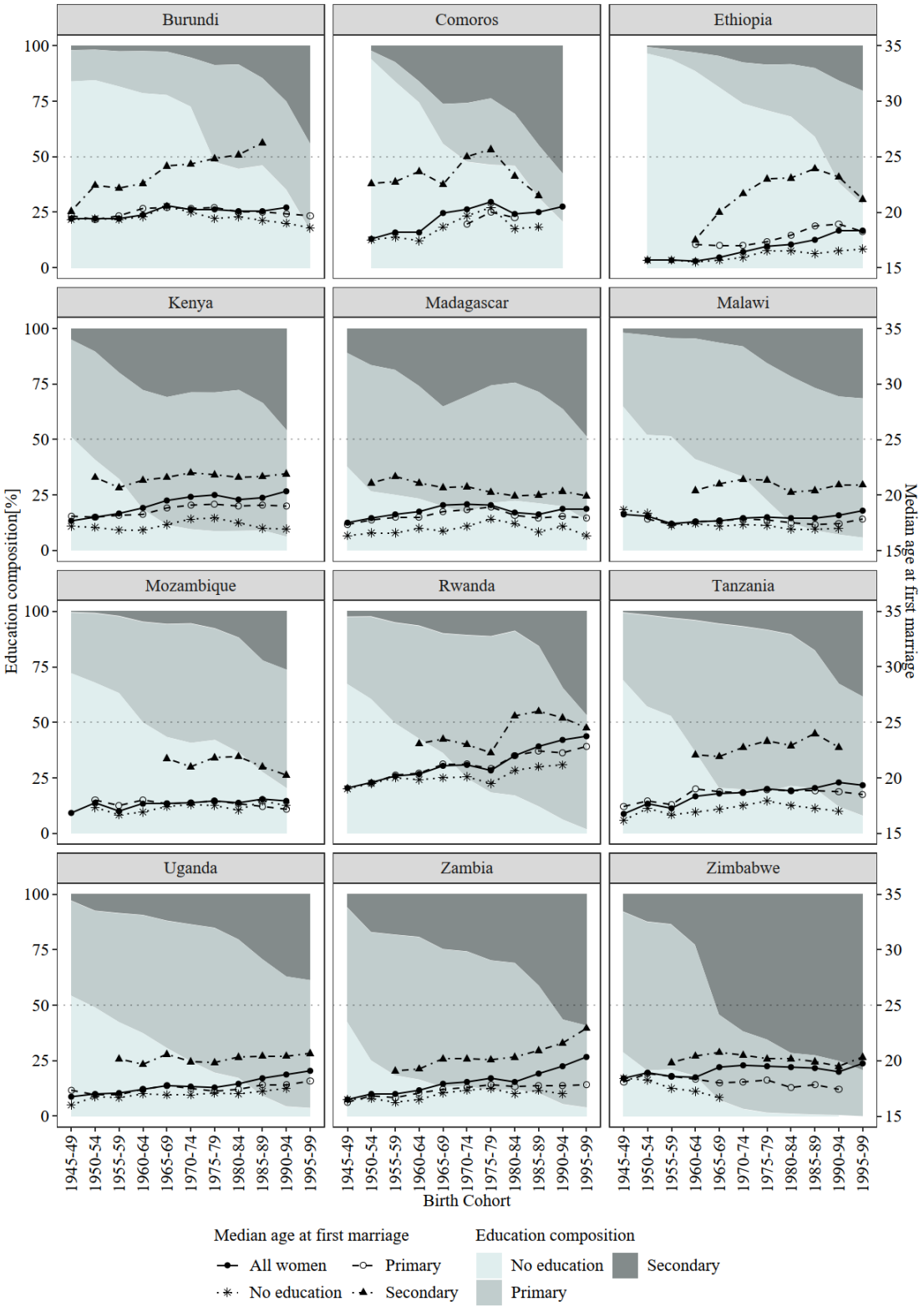
Birth Cohort	Age					
	20	25	30	35	40	45
1945	73.6	91.7	96.2	97.7	98.3	98.7
1950	71.4	90.2	95.4	97.0	97.8	98.3
1955	71.8	90.6	95.4	97.0	97.9	98.3
1960	69.0	88.5	94.6	96.6	97.6	98.1
1965	65.4	86.2	93.1	95.7	96.8	97.4
1970	63.0	84.9	92.8	95.5	96.9	97.6
1975	61.9	84.9	92.3	95.3	96.7	97.4
1980	61.4	84.0	92.5	95.7	97.2	
1985	58.9	83.2	92.0	95.4		
1990	55.4	80.4	89.5			
1995	52.5	76.9				



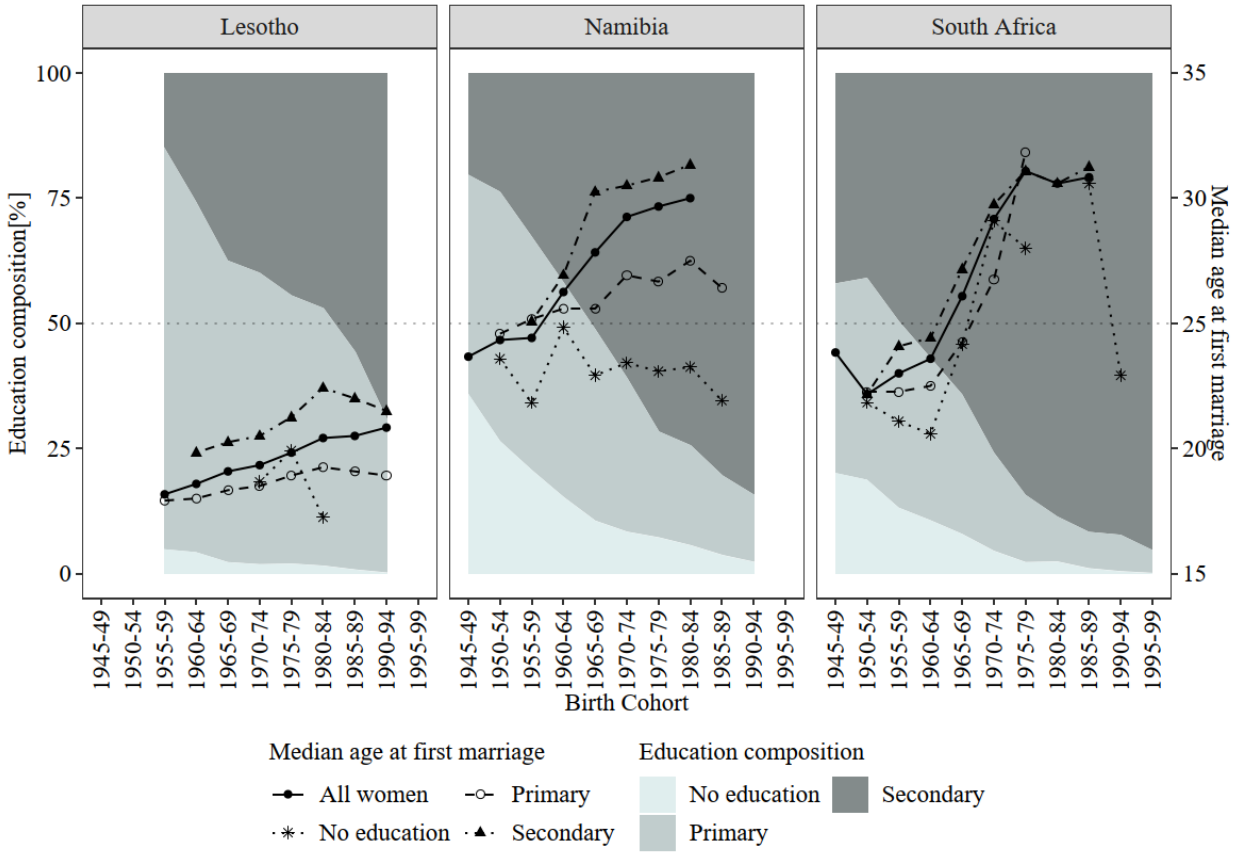
Appendix 3a: Cohort changes in median age at first marriage (according to education level) and education composition (% with no education, % with primary and % with secondary education) in West Africa



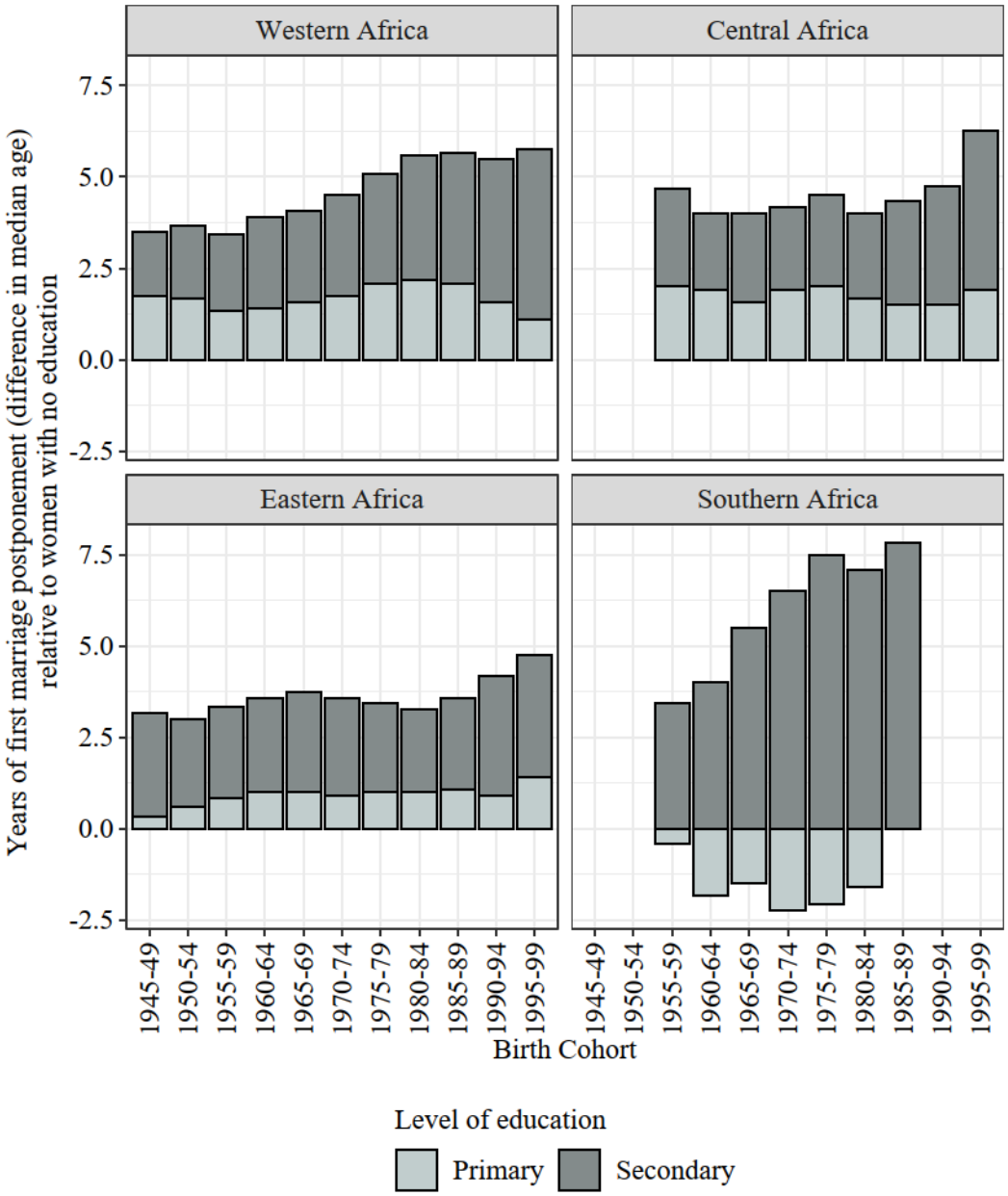
Appendix 3b: Cohort changes in median age at first marriage (according to education level) and education composition (% with no education, % with primary and % with secondary education) in Central Africa



Appendix 3c: Cohort changes in median age at first marriage (according to education level) and education composition (% with no education, % with primary and % with secondary education) in East Africa



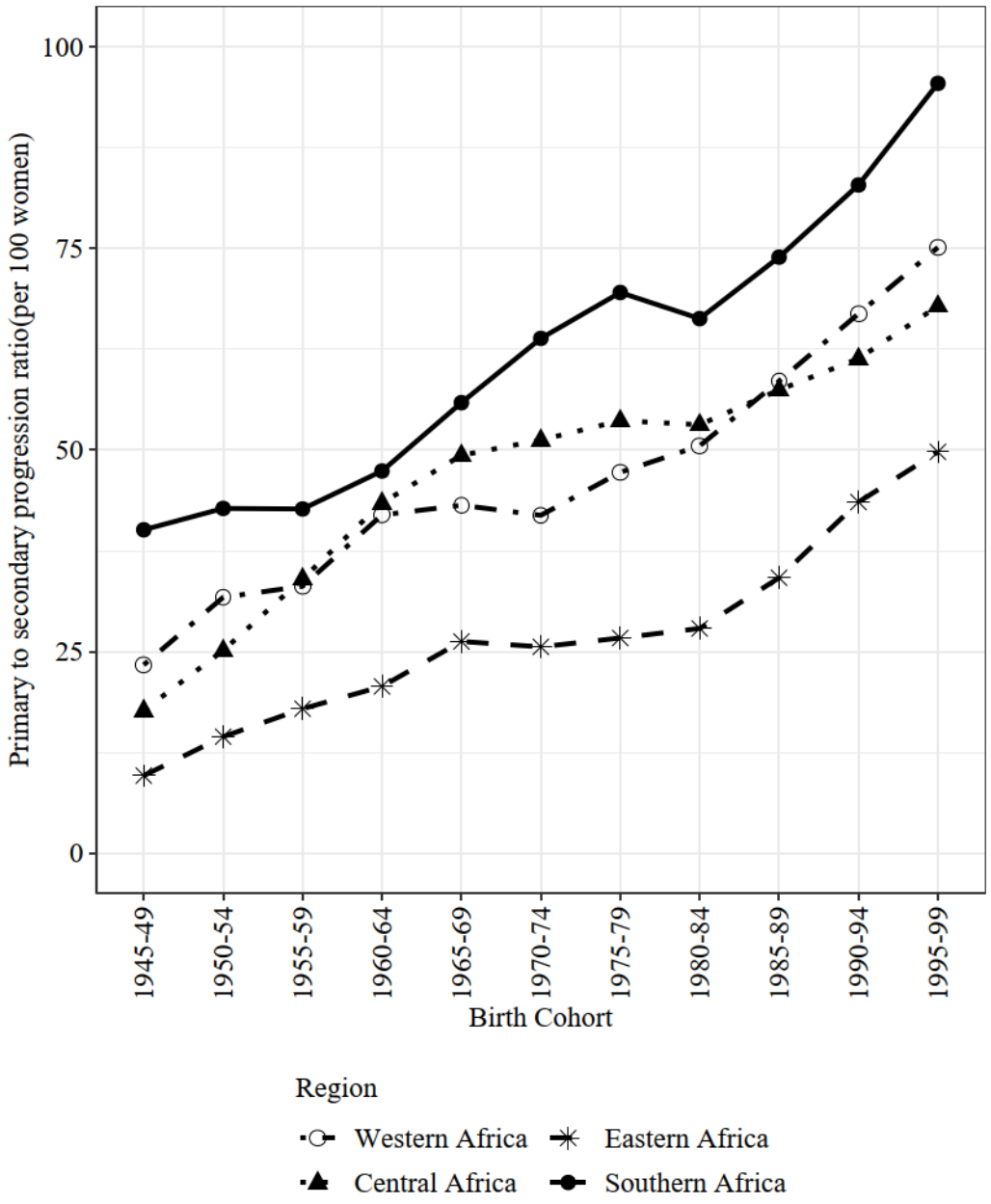
Appendix 3d: Cohort changes in median age at first marriage (according to education level) and education composition (% with no education, % with primary and % with secondary education) in Southern Africa



Appendix 4: Education gradient in the timing of first marriage in four sub-Saharan Africa regions across birth cohorts

Notes

1. On average (across all birth cohorts), and relative to women with no education, attaining primary education increased the median age at first marriage by 1.7 years in West Africa, while secondary education increased it by 4.6 years. These estimates are 1.8 and 4.5 years for Central Africa, 0.9 and 3.6 years for East Africa and -1.6 and 4.1 years for Southern Africa.



Appendix 5: Primary to secondary progression ratio over birth cohorts in four sub-Saharan Africa regions, across birth cohorts