The Contribution of Marital Dissolution and Repartnering to Fertility Variation in sub-Saharan Africa: A Macro-level Perspective

Short title: Marital Dissolution, Repartnering and Fertility in Africa

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Abstract

Research on the linkage between union dissolution, repartnering and fertility in sub-Saharan Africa (SSA) has primarily centered on a micro-level perspective of this relationship. Thus, the role of union dissolution and repartnering in shaping macro-level fertility patterns in SSA is unclear. This study uses Demographic Health Survey data to address this gap. It examines (i) the macro-level relationship between union dissolution and repartnering rates with fertility, (ii) the contribution of union dissolution and repartnering rates to cross-country fertility variation, and (iii) the influence of union dissolution and repartnering on the pace of fertility decline. The findings demonstrate that union dissolution and repartnering dynamics are important drivers of macro fertility developments in SSA. Union dissolution rates are significantly negatively associated with fertility at the population level. However, it is the proportion of women who do not remarry following a first union dissolution rather than the proportion of women who remarry that matters. Furthermore, country heterogeneity in union dissolution and repartnering rates accounts for 9.4% of cross-country fertility differences. Changes in union dissolution and repartnering rates and the fertility behaviour of women who experience these events mostly contributed to the slow pace of fertility decline. The implications of these findings on union-fertility nexus and fertility variation scholarship in SSA are discussed.

Keywords: Marriage, Union dissolution, Remarriage, Fertility transition, sub-Saharan Africa

Introduction

The uniqueness of macro (population level) fertility patterns in sub-Saharan Africa (SSA) from patterns observed elsewhere is well established in demographic literature. Three key attributes define this distinctiveness –high fertility rates, late-onset and slow pace of fertility decline (Shapiro and Gebreselassie 2008, Bongaarts and Casterline 2013, Bongaarts 2017). Early perspectives about the drivers of this fertility pattern centered on the role of social structures, mainly focusing on the influence of cultural factors sustaining high fertility rates (Caldwell and Caldwell 1987, Sonko 1994). When fertility started declining in the early 1980s, scholars noted that the decline was slower than patterns observed elsewhere and, in some countries, fertility decline stalled (Bongaarts 2008, Shapiro and Hinde 2017, Schoumaker 2019). Thus, contemporary perspectives have centered on explaining the causes of high and stalling fertility rates. Scholars have attributed the high and stalling fertility rates to the slow progress of family planning programs, disruption of female education, persistent high family size ideals, and stable or slowly increasing age at first marriage and birth (Bongaarts 2006, Ezeh, M̀beru et al. 2009, Casterline and Agyei-Mensah 2017, Kebede, Goujon et al. 2019)

The contribution of union dissolution and repartnering to macro fertility patterns in SSA is surprisingly absent from this literature, even though union dissolution and repartnering are fundamental features of nuptiality regimes in this region. Indeed, union dissolution (either through divorce or widowhood) was common in several SSA countries during the pre-transition era (Bongaarts, Frank et al. 1984, John and Nitsche 2023). Over time, union dissolution rates have declined (Clark and Brauner-Otto 2015, John and Nitsche 2022). Nevertheless, marriage institutions remain predominantly volatile, remarriage is frequent and rapid, and there is huge heterogeneity in these dynamics across countries (Reniers 2003, Clark and Brauner-Otto 2015, Guirkinger, Gross et al. 2021, John and Nitsche 2022).

At the micro-level (individual level), women who experience union dissolution, even if they remarry, end up with significantly lower fertility than women who remain in intact first unions (Elleamoh and Dake 2019, John and Adjiwanou 2022). However, the importance of marital dissolution and repartnering in shaping micro-level fertility outcomes in SSA does not inevitably imply that these events are relevant in shaping macro fertility patterns in this region. Thus, whether martial dissolution and repartnering dynamics are or are not important drivers of macro fertility developments in SSA remains unclear. Specifically, it is unclear as to whether, if so, to what extent union dissolution and remarriage rates affect fertility rates at the population level. More relatedly, it is unknown whether, if so, to what extent the cross-country heterogeneity in union dissolution and repartnering rates accounts for the cross-country fertility differences in this region. In addition, John and Adjiwanou (2022) hypothesize that marital dissolution might have contributed to the slow pace of fertility decline in SSA. However, this hypothesis has not been empirically evaluated. Thus, it is unknown whether it holds, and if so, to what extent marital dissolution and repartnering dynamics slowed the pace of fertility decline in this region. This study addresses these questions to extend the literature on the linkage between union dissolution, repartnering and fertility in SSA beyond micro-level relationships. It bridges the knowledge about dynamics of union dissolution and repartnering rates in SSA (as those documented in John and Nitsche (2022)) and the knowledge about the fertility behaviour of women who experience these events (as documented in John and Adjiwanou (2022)) to position the role of marital dissolution and repartnering in shaping macro fertility patterns in this region.

The analyses addressing these questions are divided into three parts. First, I assess the macro-level relationship between union dissolution and repartnering rates with fertility. I question whether the population size of women who experience union dissolution during their reproductive ages is associated with the level of completed fertility at a country level and how this relationship varies by repartnering status. Second, I quantify the contribution of union dissolution and repartnering rates to cross-country fertility differences in SSA and evaluate the extent to which the contribution of these nuptiality dynamics compare with the contributions attributable to known drivers of fertility variation – particularly education, urbanization, and the timing of reproductive events (first marriage and first birth). Third, I examine the influence of union dissolution and repartnering on the pace of fertility decline. Specifically, I consider counterfactual scenarios – questioning what would have been the pace of fertility decline in SSA under different union dissolution and repartnering conditions. All the analyses are based on Demographic Health Survey (DHS) data collected in 34 SSA countries. They provide novel perspectives about the interplay between marital dissolution and macro fertility developments in SSA.

Background

Perspectives about macro fertility developments in SSA: The neglected view

Fertility transition in SSA differed in several ways from the patterns observed elsewhere in the global south. During the early 1950s, the Total Fertility Rate (TFR) was around 6.4 children per woman in SSA (United Nations 2022). This rate was comparable to the TFR in Northern Africa and Western Asia (NAWA). However, it was slightly higher than the TFR in Latin America and the Caribbean (LAC) and in Central and Southern Asia (CSA) (ibid.). The uniqueness of the SSA fertility transition emerged in the early 1960s. During this period, fertility declined in NAWA, LAC, and CSA. In contrast, it increased in SSA, reaching 6.7 children per woman in 1980. Fertility started declining in SSA in the early 1980s. However, the pace was slower than elsewhere. By 2020, TFR reached 4.4 in SSA, compared to 2.5 in NAWA, 2.3 in CSA and 1.9 in LAC (ibid.).

This exceptionalism of the SSA fertility transition is connected to structural and behavioral conditions, including family planning programs, female education expansion, fertility preferences and marriage dynamics (Caldwell 1980, Bongaarts 2003, Bongaarts 2006, Ezeh, Mberu et al. 2009, Casterline and Agyei-Mensah 2017, Shapiro and Hinde 2017, Kebede, Goujon et al. 2019, Dasgupta, Wheldon et al. 2022). The discussions regarding the linkage between marriage dynamics and macro fertility patterns have primarily focused on the role of the timing of the first marriage and/or levels of permanent celibacy (Harwood-Lejeune 2001, Ezeh, Mberu et al. 2009, Shapiro and Gebreselassie 2014, Hertrich 2017, Onagoruwa and Wodon 2018). Harwood-Lejeune

(2001), for example, noted that the increase in age at marriage explained 16–33 per cent of the fertility decline observed in Southern and East Africa between 1976 and 1998. Onagoruwa and Wodon (2018) analyzed data from 10 SSA countries and showed that fertility in these countries would have been 7% to 16% lower if child marriages (before age 18) were eliminated. Hertrich (2017) argued that the increase in age at marriage was necessary for the onset of fertility transition in SSA. This body of literature, however, neglects other essential aspects of nuptiality regimes in this region – notably, the role of union dissolution and repartnering.

SSA has, indeed, a history of unstable unions and high and rapid remarriage rates. For example John and Nitsche (2022) recently found that over 20% of first unions end within 15 years in 28/34 countries they analyzed. In 14/34 countries, the proportion of first marriages ending within 25 years exceeds 40%. Scholars have also noted that most women remarry and do so quickly following a union dissolution (Bongaarts, Frank et al. 1984, Reniers 2003, Guirkinger, Gross et al. 2021, John and Adjiwanou 2022, John and Nitsche 2022). For example, 40% of women in rural Malawi remarried within two years after a divorce, and this proportion reached 70% within five years and 90% after ten years (Reniers 2003). In Burkina Faso, nearly half of the women remarried immediately after divorce (Guirkinger, Gross et al. 2021). On average, a woman in SSA spends 0.2 to 2.9 years between the dissolution of the first union and remarriage (John and Nitsche 2022).

Given these dynamics of union dissolution and repartnering, it seems surprising that the role of these events in shaping macro fertility developments in SSA has been greatly neglected in demographic literature. However, this omission seems inevitable if we consider the early conceptualization linking union dissolution, repartnering and fertility that emphasized the exposure loss to regular sexual intercourse between or after unions as the mechanism that drives this relationship (Davis and Blake 1956, Bongaarts 1978, Bongaarts 1982, Bongaarts, Frank et al. 1984). This perspective considers union dissolution as an antinatalist factor that reduces women's exposure to regular sexual intercourse, leading to a low probability of conception and, hence, low fertility. Remarriage is regarded as a mechanism that reduces the reproductive time lost due to union dissolution. Thus, given the history of rapid remarriages in SSA (Bongaarts, Frank et al. 1984, Locoh and Thiriat 1995, Reniers 2003, Guirkinger, Gross et al. 2021, John and Nitsche 2022), the duration women spend outside marriage because of union dissolution is minimal (4%-16% of the reproductive lifespan, on average) (Bongaarts, Frank et al. 1984, John and Nitsche 2022), and thus, indeed a potential negligible force of fertility variation in this region.

However, the influence of union dissolution and remarriage on fertility cannot be fully channeled via reproductive time lost between or after unions. Figure 1 presents a conceptual framework illustrating different pathways through which union dissolution and remarriage can affect fertility. It suggests that the linkage between union dissolution, remarriage, and fertility should be understood from both direct and indirect determinants of fertility perspectives. Specifically, in the absence of selection, the total effect of union dissolution and remarriage on fertility can be channeled through two pathways. The first component is what I call the *disruption mechanism*, which is implied in the proximate determinants of fertility framework and largely referred to within the context of SSA. As noted above, the effect of this disruption mechanism is likely negligible in SSA because women do not spend much reproductive period outside marriage because of union dissolutions.

The second pathway, which is potentially crucial for our understanding of the relationship between union dissolution, remarriage, and fertility within the SSA context, is what I denote as the *adaptation mechanism*. This pathway considers the link between union dissolution, remarriage and fertility from an indirect determinant of fertility perspective. The idea is that union dissolution and remarriage expose individuals who experience these events to new conditions and uncertainties that may influence their fertility by modulating their motivations to accelerate, postpone or curtail childbearing. Desire to realize such intentions may be manifested via initiation or avoidance of new partnerships following a union dissolution, contraception and birth timing behavior and, thus, influence overall fertility outcomes.

[Figure 1]

Studies conducted mainly in the global north discuss different reasons for fertility motivations (accelerate or postpone/avoid childbearing) among women who experience union dissolutions. Intentions to accelerate childbearing may include the desire to have a shared biological child with the new partner following remarriage to solidify the marriage bond – known as the commitment effect (Griffith, Koo et al. 1985, Thomson 2004). Thus, in the context of low fertility, remarried women may end up having more children than they would have realized in the absence of remarriage. This is because, in such contexts, women may already have achieved the average family size before the dissolution of the previous union(s). Selected studies have indeed confirmed this hypothesis for some sub-population groups. For example, Andersson, Jalovaara et al. (2022) noted that remarried Finnish women and men have higher cohort fertility than their counterparts in intact first unions when only formal marriages are considered. Van Bavel, Jansen et al. (2012) and Jokela, Rotkirch et al. (2010) confirmed this hypothesis only for men.

In the context of high family size ideals and high fertility rates, like SSA, however, marriages are likely to end before individuals have achieved their family size ideals. Indeed, most individuals who experienced union dissolution in SSA do so during early reproductive ages – mainly around the mid and late twenties (John and Nitsche 2022). Thus, apart from the commitment effect, childbearing in higher-order unions may be desired to attain parenthood status (if remarried individuals were childless in previous union(s)) or to achieve the desired family size. Thus, remarriage following a union dissolution may be a pathway to fulfil preexisting unaccomplished fertility goals. Hence, childbearing in higher-order unions may not necessarily lead to excess births in these settings (as it may imply a continuation of childbearing from previous union(s) rather than additional childbearing, which may have been avoided in the absence of union dissolution).

In contrast to motives to accelerate childbearing, women who experience union dissolution and remarriage may deliberately intend to postpone or avoid/curtail childbearing. Postponement of childbearing may arise due to uncertainty of the current relationship – i.e. partners in a new union may delay childbearing to ascertain the reliability of the current marriage. John (2018) found evidence for this hypothesis in the context of Malawi. He noted that when remarried women were compared to women in intact first unions at the same duration since first marriage, the desire to have a child soon was weaker among remarried women than women in intact first unions at shorter duration (where remarriages were, on average, more recent) while it was stronger at longer duration (where remarriages, on average, occurred some years back). Qualitative studies in some parts of SSA have also revealed stronger intentions among remarried women to postpone childbearing due to the uncertainty of the prevailing union (Agadjanian 2005, Towriss 2014). Moreover, studies suggest that the transition to parenthood is associated with the deterioration of marital quality for some couples (Doss, Rhoades et al. 2009, Kluwer 2010, Keizer and Schenk 2012, Bogdan, Turliuc et al. 2022). Thus, individuals whose previous union(s) ended due to deterioration of marital quality following childbirth may have a strong desire to postpone or avoid childbearing in higher older union(s) to ensure a stable marriage – which can be termed the protective effect.

Fertility postponement implies that childbearing is pushed to older ages where fecundity is generally low. Thus, women who experience union dissolution and remarriage may have a smaller complete family size than women in intact first unions, partly due to difficulties in conceiving later in their reproductive life. Curtailment of fertility may arise from the compensation effect – where the presence of stepchildren may compensate for women's or husbands' desired family size (Stewart 2002). Motives for fertility postponement or curtailment are likely to result in increased use of contraception and thus result in lower fertility.

Study empirical focus and hypotheses.

The adaptation mechanisms highlighted above suggest that although women who experience union dissolution in SSA do not spend much of their reproductive years outside marriage because of rapid remarriages (Bongaarts, Frank et al. 1984, John and Nitsche 2022), these events (marital dissolution/repartnering) likely have fundamental consequences for micro and macro fertility patterns in this region. Emerging studies that have analyzed the linkage between union dissolution, repartnering and fertility in this region provide a comprehensive micro-level perspective of this relationship and how it changes at different stages of the fertility transition (Elleamoh and Dake 2019, John and Adjiwanou 2022). Findings from these studies indicate that women who experience union dissolution, even if they remarry, end up with fewer children than women in intact first unions and that this relationship varies with the level of fertility transition. However, the importance of marital dissolution and repartnering in shaping micro-level fertility outcomes in SSA does not inevitably imply that these events are relevant in shaping macro fertility patterns in this region. Thus, whether, if so, to what extent martial dissolution and repartnering dynamics influence macro fertility patterns in SSA remains unclear.

This study addresses this gap in the literature. It bridges the knowledge about dynamics of union dissolution and repartnering rates in SSA (as those documented in John and Nitsche (2022)) and the knowledge about the fertility behaviour of women who experience these events (as documented in John and Adjiwanou (2022)) to position the role of marital dissolution and repartnering in shaping macro fertility patterns in this region. Specifically, I address this gap by, first, examining the association between union dissolution and repartnering rates with the level of fertility at the population level. I hypothesize that the negative relationship between union dissolution, repartnering and fertility that exist at the micro level persists at the macro level. Thus, (Hypothesis 1 [**H1**]) a larger population size of women who experience union dissolution is likely associated with lower fertility at the population level. However, this relationship is likely stronger for the proportion of women who do not remarry following a union dissolution than the proportion of remarried women (**H1b**) because women who remarry are likely to have stronger motivations for additional childbearing than women who do not remarry following a union dissolution.

Second, I quantify the contribution of union dissolution and repartnering rates to cross-country fertility differences in SSA. The question is to what extent union dissolution and remarriage rates explain country fertility differences in SSA, and how does its contribution (if any) compare with the contribution attributable to known drivers of macro fertility variation in this region – precisely, female education, urbanization, and timing of reproductive events (first marriage and first birth). Estimates of union dissolution and repartnering rates in SSA reveal enormous country heterogeneity regarding levels and changes over time (Clark and Brauner-Otto 2015, John and Adjiwanou 2022, John and Nitsche 2022). Thus, given **H1b**, I anticipate that this heterogeneity matters in explaining cross-country fertility differences. Hence, (**H2**) the contribution of union dissolution and remarriage rates to cross-country fertility differences in SSA is non-negligible (significantly non-zero).

Third, I assess the influence of union dissolution and repartnering on cohort fertility change within countries, focusing on its influence on the pace of fertility decline. Specifically, I consider counterfactual scenarios – evaluating what would have been the pace of fertility decline under five union dissolution and repartnering conditions; – (i) in the absence of union dissolution, (ii) in the absence of repartnering following a union dissolution, (iii) if union dissolution and repartnering rates had remained the same as those of women born 1940-49, (iv) if the effect of union dissolution and repartnering on fertility remained the same as of women born 1940-49 and (v) if both condition iii and iv prevailed. Here, I evaluate the hypothesis of John and Adjiwanou (2022) that suggests that marital dissolution contributed to the slow pace of fertility decline in SSA (**H3**). John and Adjiwanou (2022) presented this hypothesis based on their observation that the fertility of remarried women declines more slowly than that of women in intact first union (note that John and Adjiwanou (2022) excluded women whose first union ended and never remarried in their analysis. This study includes this group). They assumed that the pace of fertility declines for this group (remarried women) meaningfully contributed to the slow pace of fertility decline at the population level. In addition, John and Adjiwanou (2022) hypothesis can also follow from the fact that union dissolution rates are mostly declining in SSA (John and Nitsche 2022), implying that fertility in recent birth cohorts is likely higher than what would have been expected if union dissolution rates did not change. I rely on nuptiality and fertility histories of women born between 1940 and 1979 collected in 34 SSA countries to evaluate these hypotheses.

Data

Data for this study come from 143 Demographic Health Surveys (DHS) conducted in 34 SSA countries since 1986 (Appendix Table A1). DHS are nationally representative cross-sectional surveys. They collect full birth histories from women aged 15-49, which contain information about the date of birth of each child a woman has ever had. I use this information to construct a fertility measure for this analysis. The focus is to analyze the lifetime fertility of women who were towards the end of their reproductive ages. Ideally, that would mean limiting the analyses to women aged 45-49. However, this restriction yielded smaller sample sizes for individual countries. Therefore, I extended this age bracket to include women aged 40-44, yielding a sample size of 250,663 women aged 40-49.

DHS also collects summary marriage histories. Women are asked whether they are currently married or living with a man as married (note that the definition of marriage is fluid – both formal and informal unions are regarded as marriages to account for the flexibility of the marriage process in SSA (Meekers 1992)). The responses are Yes-currently married, Yes-living with a man, and No-not in a union. Women not in a union are asked whether they have ever married or lived with a man as if married. Responses from this question and the information on current marital status are used to identify ever or never-married women. This analysis excludes women who never married as they were not at risk of experiencing a union dissolution. It should be noted that the sample size of women aged 40-49 who never married for the pooled dataset is small (2.7%, n= 6,840) and makes a negligible contribution to fertility at the population level (~ 1.0% of observed fertility at the population level). The notable exceptions to this pattern for the specific countries are Angola, Gabon, Namibia and South Africa. In these countries, the proportion of women aged 40-49 who never married is 9.4% (n= 198), 8.1% (n=352), 20.4% (n=1085) and 22.4% (n=918), respectively. They make 5.5%, 6.6%, 16.4% and 16.5% (respectively) contribution to total fertility at the population level. Among ever-married women, DHS collects additional information about age at first marriage and lifetime remarriage status (i.e. whether a woman married or ever lived with a man as married once or more than once). I rely on these nuptiality histories to construct variables/measures capturing union dissolution and repartnering dynamics (DHS does not collect information about how previous union(s) ended among women who married more than once. Thus, union dissolution in this analysis refers to marriages ending through divorce or widowhood). Consequently, 759 women (0.31% of the ever-married sample) with missing information on these histories are excluded from the analysis.

Measures

The fertility measure I use is the Complete Family Size (CFS) – a cohort fertility measure. It indicates the number of children ever born to a woman at the end of the reproductive lifespan. Ideally, one would measure CFS at age 49+. However, this is not possible in this analysis because, by design, the fertility histories of most women are truncated at ages between 40 and 49. Thus, alternatively, I use the number of children ever born at age 40 as a measure of CFS. Assessment of the lifetime fertility achieved at different ages among women aged 45-49 suggests that, on average, over 90% of fertility attained at the end of the reproductive lifespan is achieved by age 40 (Appendix Table A2). Thus, using children ever born at age 40 to measure CFS seems a reasonable compromise of retuning sufficient sample size in the analyses while providing a reliable indicator of CFS. The calculation of children ever born at age 40 involves using the full birth histories to compute age-specific cumulated fertility for each woman in the dataset (see John and Adjiwanou (2022)). Estimates corresponding to age 40 are then aggregated and averaged to yield a macro estimate of CFS at age 40.

I combined information about current marital status and lifetime remarriage status to classify women into three distinct lifetime marital states, capturing life course experiences of union dissolution and repartnering – (1) *intact first union*, for women married once and still in intact unions at the survey (2) *married once-dissolved union*, for women married only once whose union ended, and (3) *ever-remarried* for women who married more than once regardless of whether they were married or not married at interview[1]. This variable is then used to calculate the percentage of ever-married women who experienced a union dissolution, the percentage of women whose first union dissolved and never remarried and the percentage of women who ever-remarried to measure union dissolution and repartnering rates at the population level. Besides these measures, I also used information about women's highest education attainment (no education, primary and secondary or higher – 11 women with an unknown level of education are excluded from the analysis), area of residence (rural vs. urban), age at first marriage (excluded 408 women with improbable age at first marriage (<10 years)), and age at first birth to construct variables/measures used in the analytical models (see Table 1).

[Table 1]

Methods

Association between union dissolution, repartnering and fertility at the macro level

[1] Ever-remarried women were first classified into two categories – *remarried-dissolved union*, for women who married more than once but were not in a union at the time of the survey, and *remarried* for women who were in second or higher-order unions at the survey. However, the sample size of the *remarried-dissolved union* group is small (5.2% of the ever-married sample). Hence, I opted to combine these two groups into one category.

The first objective of this study is to assess the association between union dissolution and repartnering rates with the level of fertility at the population level. To address this objective, I constructed a panel dataset from a pooled sample of all women included in this analysis, with countries as clusters, birth cohorts (five-year intervals) as observations, and measures specified in Table 1 as variables (calculated for each cohort). The year of birth for women considered for this analysis varies between 1936 and 1982. Thus, women born before 1940 and after 1979 were dropped from the analysis to achieve conventional complete five-year birth cohorts. The constructed panel dataset yielded 226 observations, with sample size per cohort varying between 2 to 6450 women. Thus, I restricted the analyses to cohorts with a minimum sample size of 200 women to ensure stable estimates (205 birth cohorts returned). Nevertheless, for robustness, I also considered birth cohorts with a minimum sample size of 100 women (219 birth cohorts returned).

Using the derived panel dataset, I first analyzed the pattern of the group size and fertility rates of women in different marital states (intact first union, married once-dissolved union, and ever-remarried) over birth cohorts. I then specified four country-level fixed effects (FE) linear models to assess the association between the average CFS and union dissolution and repartnering rates at the population level. Model 1 considers this relationship with respect to the proportion of women who ever experienced union dissolution (regardless of whether they remarried) and without controlling for any potential confounding factors. Thus, this specification generally captures how union dissolution rates changed in parallel to fertility rates over birth cohorts. Model 2 accounts for such cohort trends by adding birth cohort dummy variables to Model 1. The resulting model, thus, reflects the association between the average CFS and union dissolution rates independent of the birth cohort. The association depicted by Model 2 is likely confounded by other known predictors of fertility, such as education, age at first marriage, age at first birth, and urbanization, some of which are also correlated with union dissolution rates (Clark and Brauner-Otto 2015). Model 3 adjusts for such factors by adding education, age at first marriage, age at first birth, and urbanization measures specified in Table 1 to Model 3.

I should note that as much as it is important to consider other essential predictors of fertility and union dissolution rates, such as generic development measures (e.g. GDP) in Model 3, it is practically impossible to calculate such measures for specific birth cohorts. This is because the lives of individuals born at different periods overlap; thus, different birth cohorts are exposed to similar economic conditions. The relationship between CFS and union dissolution rates modelled in this paper, thus, may not necessarily be causal. Nevertheless, by design, Model 3 (also Model 1&2) accounts for any unobservable but invariable country-level factors that may confound the relationship between union dissolution rates and fertility at the population level.

Studies suggest that women who remarry may partially or fully recover fertility, which could be lost in the absence of remarriage following a union dissolution (Meggiolaro and Ongaro 2010, Thomson, Winkler-Dworak et al. 2012). Thus, the effect of the proportion of women whose first union dissolved and never remarried on fertility may differ in magnitude or direction from that of the proportion of remarried women. Therefore, Model 4 examines this aspect by replacing the proportion of women who ever experienced union dissolution in Model 3 with the percentage of women whose first union dissolved and never remarried and the percentage of ever-remarried women. Specifically, Model 4 (hereafter, also referred to as a full model) is specified as

$$CFS_{tj} = \gamma_1\%\, married\ once(not\ in\ union)_{tj} + \gamma_2\%\, remarried_{tj} + \boldsymbol{\delta}_t + \boldsymbol{\beta X}_{tj} + \alpha_j + \varepsilon_{tj} \qquad \text{(Eq. 1)}$$

CFS_{tj} in Eq.1 represents CFS for birth cohort t in country j. γ_1 and γ_2 are regression coefficients associated with the percentage of women whose first union dissolved and never remarried and the percentage of ever-remarried women, respectively. $\boldsymbol{\delta}_t$ represents a matrix of coefficients for birth cohort dummy variables. $\boldsymbol{X}_{tj}$ represents a matrix of control variables (education, age at first marriage and urbanization) measures, and $\boldsymbol{\beta}$ is a matrix of corresponding coefficients. α_j is the country-specific intercept, and ε_{tj} denotes the associated error term.

Contribution of union dissolution and repartnering rates to cross-country fertility variation.

The second objective of this study concerns quantifying the contribution of union dissolution and repartnering rates to cross-country fertility differences in SSA and assessing how this contribution compares with the contribution attributable to education, urbanization, age at first marriage and age at first birth. To address this objective, I use the full FE model specified above to partition the explained variation in CFS (i.e. the model R^2) into components attributable to each of the variables included in the model. Such partitioning is straightforward when the covariates in the model are uncorrelated. In such a case, the bivariate R^2, which is the squared correlation coefficient of the outcome variable and the explanatory variable in question, accurately measures the variable contribution to the total explained variation in the outcome variable. However, when covariates are correlated, as in this study, the bivariate R^2 overestimates the contribution of the variable to the total explained variation in the outcome variable. Notwithstanding this limitation, bivariate R^2 still provides valuable information. Notably, it provides a benchmark for quantifying the contribution of a given variable to the variation in the outcome variable due to its correlation with other factors. Therefore, as a preliminary analysis, I computed bivariate R^2 for each variable specified in the full FE model above and presented the results in the appendix (Table A4).

Following this preliminary analysis, I used hierarchical partitioning of R^2 in linear models proposed by Lindeman, Merenda et al. (1980) and generalized by Chevan and Sutherland (1991) to quantify the contribution of union dissolution and repartnering to cross-country fertility variation. Hierarchical partitioning of R^2 is a variance decomposition technique that isolates the actual contribution of a given variable to variation in the outcome when covariates are correlated. It involves calculating the increments in model R^2 when variables are added to the model one after another. These increments are calculated for all possible combinations of variable ordering (i.e. how variables are entered into the model). The component of model R^2 attributable to variable X_k ($R^2_{x_k}$) is then calculated as the average of increments associated with X_k over all possible orderings – i.e.

$$R^2_{x_i} = \frac{1}{k!}\sum_{j=1}^{k!} R^2_{x_{ij}} \; ; i = 1,2, \dots . k \qquad \text{(Eq.2)}$$

k! in Eq.2 is the total number of possible ordering for k explanatory variables.

The key limitation of hierarchical partitioning of R^2 is that it quickly becomes computationally intense with an increasing number of variables in the model. For example, there are 40,320 possible variable orderings for the full FE model specified above (Eq.1), which implies 322,560 regression models to run (eight models for every variable ordering). To ease this computation intensity, I consider a "variable" for this analysis to refer to measure categories specified in Table 1. Thus, measures relating to a common measure category are treated as one variable and enter the model together. For example, all education measures enter the model as a unit and capture the contribution of education to model R^2. Thus, in principle, the full FE model specified above has six explanatory variables. This specification implies 720 possible "variable" orderings. Using this specification, I first performed a hierarchical partitioning of R^2 using the original analytical sample. I then performed a similar analysis using 1000 bootstrap samples[2] to compute the median, and the 95% confidence intervals of the contribution of each variable to the total explained variation in CFS.

It is important to note that age at first marriage is a proximate determinant of fertility. Education and urbanization are background variables that affect fertility via proximate determinants of fertility. On the other hand, and as argued earlier in this paper, union dissolution and repartnering operate as both a proximate determinant of fertility (the disruption mechanism pathway) and a background variable (the adaptation mechanism pathway). Thus, by performing hierarchical partitioning of R^2 using the full model specified above, I isolate the contribution of education and urbanization to cross-country fertility variation channeled via other proximate determinants of fertility other than age at marriage and union dissolution. Similarly, the contribution of union dissolution and repartnering is independent of education and urbanization dynamics but captures its contribution as a background variable via other proximate determinants of fertility other than age at marriage (union dissolution and repartnering cannot influence age at first marriage, but its effect on fertility can be modulated by the timing of first marriage) and its direct contribution as a proximate determinant of fertility.

Removing the contribution of education and urbanization to fertility variation channeled via age at first marriage and age at first birth, as implied in the full model above, may be perceived as too restrictive. Thus, I performed an additional analysis that considers the contribution of union dissolution and repartnering to fertility variation when considered with only background variables (education and urbanization) – i.e. a hierarchical partitioning of R^2 based on a reduced model that excludes age at first marriage and age at first birth from the full model specified above. This

[2] Bootstrap samples are new datasets generated by drawing a random sample with a replacement from the original dataset. This study generated bootstrap samples for specific countries and surveys. The county and survey-specific bootstrap samples were then combined to create a pooled bootstrap sample dataset.

specification isolates the contribution of education and urbanization to fertility variation channeled through all proximate determinants of fertility except marital dissolution (reproductive years lost between or after unions). Similarly, I also examine the contribution of union dissolution and repartnering rates to fertility variation when considering only age at first marriage and age at first birth – i.e. a hierarchical partitioning of R^2 based on a reduced model that excludes education and urbanization from the full model specified above. In either of these reduced models, the contribution of union dissolution to fertility variation constitutes its direct (as a proximate determinant) and indirect (as a background variable) contribution.

Influence of union dissolution and repartnering dynamics on the pace of fertility decline

The third objective of this study is to evaluate the influence of union dissolution and repartnering on the pace of fertility decline (within individual SSA countries and for the SSA region as a whole). To address this objective, I performed counterfactual analyses[3] to compare the observed pace of fertility decline (measured as the slope of the cohort changes in the observed level of CFS) with the anticipated pace of fertility decline (measured as the slope of the cohort changes in the expected level of CFS) under five different union dissolution and repartnering dynamics scenarios. The first scenario evaluates what would have been the pace of fertility decline in the absence of union dissolution. On the other hand, the second scenario considers what would have been the pace of fertility decline in the absence of repartnering following a union dissolution. One way to evaluate these two scenarios is to use the full model specified above with different covariate and coefficient combinations. However, such an approach cannot provide estimates that can be realistically identified with individual countries. Thus, instead, I evaluate these scenarios on the basis that the observed CFS for each birth cohort t (CFS_{ot}) is a weighted sum of observed CFS for women of birth cohort t in different marital states, weighted by marital states group sizes. Specifically, CFS_{ot} can be expressed as

$$CFS_{ot} = \sum_i P_{t,i} CFS_{ot,i} \quad \text{(Eq.3)}$$

$P_{t,i}$ in Eq.3 is the proportion of women of birth cohort t, in marital state i. $CFS_{ot,i}$ is the observed CFS of women in marital state i, of birth cohort t. Thus, I estimate the expected CFS for birth cohort t (CFS_{et}) for the first scenario using equation 3 by assuming that women who experienced union dissolution would have had the same fertility rates as women in intact first unions if their first unions had remained intact and all other factors were held constant. For scenario 2, I estimate CFS_{et} by assuming that women who ever remarried would have had the same fertility experience as women whose first union dissolved and never remarried if they had not remarried and all other factors were held constant. Thus, if i=1,2, and 3 represent intact first union, married once-dissolved union and ever-remarried marital states, respectively, CFS_{et} for scenarios 1 and 2 can be specified as follows:

[3] A counterfactual analysis here refers to comparing the observed fertility outcome and the expected fertility outcome (CFS) under hypothetical union dissolution and repatterning conditions.

Scenario 1

$$CFS_{et} = P_{t,1}CFS_{ot,1} + \sum_{i=2}^{3} P_{t,i}\left(CFS_{ot,i} - CFS_{at,i} + CFS_{at,1}\right) \quad \text{(Eq.4)}$$

Scenario 2

$$CFS_{et} = P_{t,3}\left(CFS_{ot,3} - CFS_{at,3} + CFS_{at,2}\right) + \sum_{i=1}^{2} P_{t,i}CFS_{ot,i} \quad \text{(Eq.5)}$$

$CFS_{at,i}$ in Eq.4 and Eq.5 is the adjusted CFS for women of birth cohort t and in marital state i, adjusted for composition differences across marital states. I derived these adjusted CFS estimates by fitting birth cohort-specific Poisson regression models that control for education[4], area of residence and age at marriage using the original individual data rather than the constructed panel data used to address the first and second objectives above. Besides, in these models, I do not control for age at first birth to ensure that women with zero parity are included in the analysis. For each model, I estimated $CFS_{at,i}'s$ by obtaining predicted marginal CFS specific to each marital state.

The third scenario evaluates the expected pace of fertility decline if union dissolution and repartnering rates observed among women born 1940-49 applied across all birth cohorts. The fourth scenario poses a similar question but considers what would have been the pace of fertility decline if the effects of union dissolution and remarriage on fertility remained the same as those of women born 1940-49. The fifth scenario combines the third and fourth scenarios. I used a decomposition analysis[5] of cohort changes in CFS to evaluate these three scenarios. The basis for this approach is that for any two birth cohorts, t and t-1, the observed CFS for birth cohort t (CFS_{ot}) can be expressed as a function of observed CFS for birth cohort t-1($CFS_{o(t-1)}$) and the difference in CFS between these two cohorts ($\Delta CFS_{o(t,t-1)} = CFS_{o(t-1)} - CFS_{ot}$) – i.e.

$$CFS_{ot} = CFS_{o(t-1)} - \Delta CFS_{o(t,t-1)} \quad \text{(Eq.6)}$$

$\Delta CFS_{o(t,t-1)}$ in Eq.6 can be decomposed using multivariate regression techniques into a component due to composition changes and a component due to changes in the coefficients of the explanatory variables. Specifically, if we specify a multivariate regression model to decompose $\Delta CFS_{o(t,t-1)}$, which takes explanatory variables X_i (representing lifetime union dissolution and repartnering status) and $\boldsymbol{y}_*$ (representing a matrix of all other control variables – in this case, level of education, area of residence and age at marriage), then Eq.6 can be rewritten as

$$CFS_{ot} = CFS_{o(t-1)} - (\Delta X_{i(t,t-1)}^{c} + \Delta X_{i(t,t-1)}^{\beta} + \Delta \boldsymbol{y}_{*(t,t-1)}^{c} + \Delta \boldsymbol{y}_{*(t,t-1)}^{\beta} + \Delta\alpha_{t,t-1}) \quad \text{(Eq.7)}$$

[4] Education is classified into two levels (none Vs primary+) for Benin, Chad, Ethiopia, Mozambique, Niger and Tanzania because of the small sample of women with a secondary+ level of education (< 2.5%) for the base cohort

[5] Decomposition analysis involves partitioning a change in rates of an outcome between two periods (or groups) into a component due to changes in within-group behaviour and a component due to changes in group size. This study focuses on decomposing the change in CFS between two birth cohorts. The focus is to isolate the change due to changes in the fertility behaviour of women across different lifetime marital states and a change due to the changes in the proportion of women constituting each marital state.

$\Delta X^{c}_{i(t,t-1)}$ and $\Delta X^{\beta}_{i(t,t-1)}$ in Eq.7 indicate the component of $\Delta CFS_{o(t,t-1)}$ due to changes in union dissolution and repartnering rates and a component due to changing effects of union dissolution and repartnering on CFS, respectively. $\Delta \boldsymbol{y}^{c}_{*(t,t-1)}$ and $\Delta \boldsymbol{y}^{\beta}_{*(t,t-1)}$ indicate the corresponding components attributable to the level of education, area of residence and age at marriage. $\Delta\alpha_{t,t-1}$ is a component of $\Delta CFS_{o(t,t-1)}$ due to the change in the model intercept. Equivalent to scenarios 1 and 2, I specified Poisson regression models to perform a multivariate decomposition of cohort changes in CFS, comparing women born 1940-49 and each subsequent birth cohort. These decomposition analyses are performed using the *mvdcmp* command available in Stata (Powers, Yoshioka et al. 2011). For each decomposition, I capture estimates corresponding to the last five quantities in Eq.7 and calculate expected CFS for birth cohort t, CFS_{et}, for the third, fourth and fifth scenarios as follows:

Scenario 3;

$$CFS_{et} = CFS_{o(t-1)} + \Delta X^{c}_{i(t,t-1)} - (\Delta X^{\beta}_{i(t,t-1)} + \Delta \boldsymbol{y}^{c}_{*(t,t-1)} + \Delta \boldsymbol{y}^{\beta}_{*(t,t-1)} + \Delta\alpha_{t,t-1}) \qquad \text{(Eq.8)}$$

Scenario 4;

$$CFS_{et} = CFS_{o(t-1)} + \Delta X^{\beta}_{i(t,t-1)} - (\Delta X^{c}_{i(t,t-1)} + \Delta \boldsymbol{y}^{c}_{*(t,t-1)} + \Delta \boldsymbol{y}^{\beta}_{*(t,t-1)} + \Delta\alpha_{t,t-1}) \qquad \text{(Eq.9)}$$

Scenario 5;

$$CFS_{et} = CFS_{o(t-1)} + \Delta X^{c}_{i(t,t-1)} + \Delta X^{\beta}_{i(t,t-1)} - (\Delta \boldsymbol{y}^{c}_{*(t,t-1)} + \Delta \boldsymbol{y}^{\beta}_{*(t,t-1)} + \Delta\alpha_{t,t-1}) \qquad \text{(Eq.10)}$$

$t-1$ in Eq.8-10 is fixed and corresponds to the 1940-49 birth cohort. However, the earliest available birth cohort in a few countries (Chad, Ethiopia, Gabon, Guinea and Niger) is 1950-54. Thus, I use 1950-54 birth cohort as a reference in these countries. t varies and corresponds to birth cohorts 1950-54, 1955-59, …., 1975-79.

To objectively and consistently compare the pace of fertility decline, I estimated the slopes of cohort changes in CFS (for both observed and expected) over birth cohorts for which the counterfactual CFS estimates are available for all five scenarios. In most countries, these estimates are available for birth cohort 1950-54 through 1970-74. Thus, I fitted the slopes over these birth cohorts. Furthermore, to ensure the reliability of the estimated slopes, I only report results of countries with at least four data points between 1950-54 and 1970-74 birth cohorts.

Results

Cohort changes in union dissolution, repartnering and fertility rates.

Figure 2 shows the composition size and fertility rates of women in different marital states over birth cohorts. It presents results for the SSA region (as a whole, first panel) and 34 individual countries. The lines depict fertility estimates (scale on the left), and the background area demarcated by dashed lines shows the fraction of women in each marital state (scale on the right).

[Figure 2]

The fertility patterns in Figure 2 reveal that lifetime fertility is high in SSA, with huge heterogeneity between countries. The CFS among all women is mostly at least five children per woman across all birth cohorts in all countries except Gabon, Namibia, Lesotho, South Africa and Zimbabwe. For women born 1970-74, CFS ranges between 3.0 children in South Africa and 7.5 children in Niger. Furthermore, Figure 2 shows that fertility rates differ by marital status regarding the level and pace of decline. Women in intact first unions mostly have the highest fertility rates, followed by ever-remarried women. Only remarried women in Sierra Leone had higher fertility than those in intact first unions across all birth cohorts. Concerning fertility change over birth cohorts, it is evident that fertility among all women and within specific marital groups declined in most SSA countries. The main exceptions are Chad and Niger, where fertility increased, and Angola, Congo (DRC) and Gambia, where fertility among all women remained mostly stable but changed in different directions for the specific marital groups. However, in countries where fertility decreased, the pace of decline is slower for ever-remarried women than those in intact first unions (as John and Adjiwanou (2022) noted), giving rise to convergence and, in some countries, a crossover of fertility rates between these two groups. We can also note that fertility rates for women whose first union dissolved and never remarried mostly declined faster than the other two groups (John and Adjiwanou (2022) did not consider this group in their analysis). Thus, not only convergence but also divergence in fertility rates across marital states is emerging in SSA.

The union dissolution and repartnering rates in Figure 2 portray three prominent features of union dissolution and repartnering dynamics in SSA—first, high union dissolution rates characterized by frequent remarriages. The proportion of women who experienced union dissolution is at least 35% across all birth cohorts in 18 countries. Over 60% of women (across all birth cohorts) who experienced this event remarried in more than half of the countries. Second, large cross-country variation exists in levels of union dissolution and repartnering. For example, for the 1950-54 birth cohort, the proportion of women who experienced a union dissolution varied between 29.0% in Mali and 56.8% in Ethiopia. These figures range between 14.7% in Mali and 55.4% in Congo for women born 1970-74. Third, mostly decreasing levels of union dissolution and repartnering rates are observed. The percentage of women whose first union ended declined over birth cohorts in most countries except Congo, Gabon, Kenya and Zimbabwe, where it increased. Nevertheless, we can note that the fraction of women whose first union dissolved remained stable or slowly increased before declining in several countries. Moreover, the percentage of women whose first union dissolved and never remarried generally remained stable or slightly increased over birth cohorts, reflecting declining remarriage rates. The subsequent sections refer to these dynamics to aid our understanding of the results specific to the three objectives addressed in this study.

Association between union dissolution and repartnering rates and fertility at the macro level

Table 2 displays the results of the country-level FE models specified to examine the relationship between union dissolution, repartnering rates, and fertility at the population level. Model 1 considers this relationship with respect to the proportion of women who experienced a union dissolution (regardless of whether they remarried) and without controlling potential confounding factors. The results suggest a significant positive association between the percentage of women who experience a union dissolution and fertility at the population level. This finding principally reflects how union dissolution rates changed in parallel with fertility rates over birth cohorts. Indeed, the percentage of women whose first union dissolved mostly declined as fertility decreased (Figure 2).

[Table 2]

Model 2 accounts for these cohort trends. The results show that the positive relationship between the percentage of women who experience a union dissolution and fertility disappears and becomes significantly negative. It is found that a unit per cent point increase in the population size of women aged 40-49 who have ever experienced marital dissolution is associated with an average reduction in CFS of 0.0275. This estimate is equivalent to saying that having two women in every five ever-married women aged 40-49 whose first union dissolved (the median estimates in Table 1 (42.3%) rounded to the nearest ten) is associated with an average reduction in CFS of about 1.10 (40×0.0275). The pattern of Model 2 results persists even after controlling for education, age at first marriage, age at first birth and urbanization (Model 3). Nevertheless, the magnitude of the effect slightly decreases. Specifically, Model 3 shows that if the factors mentioned are adjusted, having two women in every five ever-married women aged 40-49 whose first union dissolved is associated with an average reduction in CFS of 0.90 (40×0.0224). These results suggest that the prevalence of marital dissolutions in a population matters in explaining fertility at the population level.

Model 4 sheds more insight into this relationship by considering repartnering dynamics. It shows the association between the percentage of women whose first union dissolved and never remarried with fertility and a corresponding relationship regarding the percentage of ever-remarried women. The results reveal a significant negative association between the percentage of women who do not remarry following a union dissolution and fertility. On average, having two women in every five ever-married women aged 40-49 whose first union ended and never remarried (2/5 is used here for consistency and comparability with the estimates reported above) is associated with a reduction in CFS of 1.56 (40×0.0390). On the other hand, the findings revealed no association between the percentage of women who remarry and fertility (although the coefficient is negative). Robustness models that considered (i) fertility attained at age 45 among women aged 45-49, (ii) cohorts with a minimum sample size of 100 women, and (iii) an Ordinary Least Squares (OLS) regression model specification also returned similar results (Appendix Table A3).

Contribution of union dissolution and repartnering rates to cross-country fertility variation.

The findings of Model 4 signal that cross-country differences in union dissolution and repartnering rates are likely essential in understanding cross-country fertility differences in SSA. This view is more apparent in Figure 3, which shows the contribution of country heterogeneity in union dissolution and repartnering rates to cross-country fertility variation in SSA. For each factor, in Figure 3, the bars show the explained variation in CFS attributable to the factor in question. The points and lines within each bar show the median estimate of the explained variation in CFS with the corresponding 95% confidence interval based on 1000 bootstrap samples.

[Figure 3]

The red bars (top bars across all factors) show results based on the hierarchical partitioning of R^2 for the full model (Model 4 in Table 2). This model explains 83.6% of the observed cross-country fertility variation. Union dissolution and repartnering rates contribute 9.4% points to this explained variation. The birth cohort contributes the most (20.4% points), and urbanization the least (9.0% points). Further, results for the full model in Figure 3 show that the contribution of union dissolution and repartnering rates to cross-country fertility variation in SSA is non-negligible (significantly different from zero). Moreover, its contribution is comparable to the contribution due to urbanization, and it is as much as about three-fourths of the variation attributable to age at first marriage and about half of the variation due to education.

The blue bars (bottom bars for education and urbanization, middle bars for union dissolution and birth cohort) show results of a hierarchical partitioning of R^2 based on a reduced model (Reduced model (a)) that excludes age at first marriage and age at first birth from the full model. The total cross-country fertility variation explained by this model is 78.5%. As should be expected, the absolute contributions attributable to factors included in this model are relatively higher than the corresponding contributions based on the full model. Union dissolution and repartnering contribute 13.3% points to the total explained variation. Urbanization contributes 12.1% points, education accounts for 25.3% points, and birth cohort explains 27.8% points. However, the conclusion regarding the relative importance of factors remains the same – union dissolution and repartnering dynamics are as crucial as urbanization, and their contribution to fertility variation is about half that explained by education.

The green bars (bottom bars for union dissolution, age at first marriage, age at first birth and birth cohort) show findings for a hierarchical partitioning of R^2 based on a reduced model (Reduced model (b)) that excludes education and urbanization from the full model. This model explains 80.8% of cross-county fertility variation. Similarly, this specification returns higher absolute contributions for the specified factors. However, the relative importance between factors remains the same as in the full model– the contribution of union dissolution and repartnering rates to cross-country fertility variation is about three-fourths that explained by age at first marriage. It is also important to note that the contribution of union dissolution and repartnering rates to fertility variation across the three models in Figure 3 do not differ statistically (the 95% confidence intervals overlap).

Influence of union dissolution and repartnering dynamics on the pace of fertility decline

Figure 4 presents the results of the counterfactual analyses performed to quantify the influence of union dissolution and repartnering dynamics on the pace of fertility decline for the SSA region (as a whole) and 26 individual countries. It shows the relative fertility difference (in percentage) between the observed and expected fertility (for three of the five scenarios I evaluated) over birth cohorts. Table A5 in the appendix show the actual observed and expected fertility estimates (for all five scenarios). The direction and length of the bars (magnitude of the deviation from 0) in each panel of Figure 4 indicate the direction and extent to which a given union dissolution and repartnering scenario could have impacted cohort-specific fertility rates. A positive deviation indicates that fertility would have been higher under the scenario in question, and the larger the deviation from 0, the greater the influence.

[Figure 4]

Results for the SSA region (as a whole) suggest that cohort fertility for the SSA region would have been about 4%-7% higher in the absence of union dissolution (Scenarios 1) and about 0.4%-2.6% lower if women did not remarry following a union dissolution (Scenarios 2). Scenarios 5 (a combination of Scenarios 3 and 4) depict the influence of the actual changes in union dissolution and repartnering rates (Scenario 3) and the changes in the effect of union dissolution and repartnering on fertility (Scenario 4) that prevailed over birth cohorts. Results for this scenario indicate that the impact of union dissolution and repartnering on fertility has been more evident among women born after 1965-69 (primarily because the proportion of women who experienced union dissolution did not change considerably, at least until women born 1960-64 – see Figure 2). It is found that the fertility of women born during this period would have been about 2.3% lower if union dissolution and repartnering rates and the effect of union dissolution and repartnering on fertility remained as those of women born 1940-49.

For individual countries, the influence of union dissolution and repartnering dynamic on the level of fertility is quite diverse. First, the absence of union dissolution would have resulted in higher fertility across all countries. However, fertility would have been much higher in countries with the highest fertility levels than elsewhere (see Appendix Figure A1). This finding is consistent with John and Adjiwanou (2022) observation that the reducing effect of union dissolution/remarriage on fertility is larger in high fertility settings and smaller elsewhere. Second, Figure 4 illustrates that the expected level of fertility corresponding to scenario 5 deviates notably from the observed estimates in Burkina Faso, Cameroon, Cote d'Ivoire, Ethiopia, Madagascar, Malawi, Mozambique, Namibia, Senegal, South Africa, Zambia, and Zimbabwe. This pattern means that cohort changes in union dissolution and repartnering dynamics had more influence on fertility levels in these countries than elsewhere. Nevertheless, the expected level of fertility corresponding to scenario 3 (see Appendix Table A5) is closely similar to observed estimates in these countries. Thus, it suggests that much of the influence of union dissolution and repartnering dynamics on fertility was driven mainly by cohort changes in the effects of union dissolution and repartnering on fertility rather than changes in union dissolution and repartnering rates. Third, the influence of union dissolution and repartnering on fertility is distinct in Burkina Faso, Cameroon, Namibia, South Africa, and Zimbabwe. Changes in union dissolution and repartnering rates and the effect of union dissolution and repartnering on fertility (mostly the latter) offset the level of fertility in these countries.

[Table 3]

Concerning the pace of fertility transition, the results reveal that union dissolution and repartnering dynamics mostly slowed the pace of fertility decline. The results for the SSA region (as a whole) are summarized in Table 3. CFS declined on average by 45.6 births per 1000 women for each subsequent birth cohort. However, this decline would have been about 1.20 and 1.18 times faster in the absence of union dissolution or remarriage following a union dissolution, respectively. It would have been 1.24 times faster if union dissolution and repartnering rates and the effect of union dissolution and repartnering on fertility remained as of women born 1940-49.

[Figure 5]

Figure 5 compares the observed and expected pace of fertility decline (for scenarios 1, 2 and 5) for individual countries. The solid black line is the reference line of no difference between the expected and observed pace of fertility decline. Points falling below this line and below zero on the x and y-axis indicate that the observed pace of fertility decline is slower than what would have been expected. It is evident in Figure 5 that most points indeed fall below this reference line, indicating that union dissolution slowed the pace of fertility decline in most countries. Nevertheless, in a few countries, specifically Ghana, Kenya, Liberia, South Africa, and Zimbabwe, estimates (mainly those corresponding to scenario 5) are notably above the reference line. This pattern suggests that changes in union dissolution and repartnering rates and the effect of union dissolution and repartnering on fertility that prevailed in these countries facilitated a relatively rapid pace of fertility decline. However, it should be noted that only changes in union dissolution and repartnering effect on fertility account for the observed patterns in Ghana and Liberia. For Ghana, the pace of fertility decline would have been the same as the observed if only union dissolution and repartnering rates remained stable. On the other hand, the pace would have been 1.18 times faster than the one observed in Liberia under the same circumstances.

Discussion and conclusion

This study extends the emerging research that has analyzed the intersection between union dissolution, repartnering and fertility at the micro level in SSA. It provides a macro-perspective to our understanding of this relationship, thus positioning the role of union dissolution and repartnering dynamics in the discourse on macro fertility developments in this region. Theoretically, the paper urges for *adaptation mechanisms,* which involve adjustments of fertility intentions following a union dissolution or repartnering, as a central pathway through which union dissolution and repartnering influence fertility outcomes. The empirical analyses used DHS data collected in 34 SSA countries to analyze (i) the macro-level association between union dissolution and repartnering rates with fertility, (ii) the contribution of union dissolution and remarriage rates to cross-country fertility variation, and (iii) the influence of union dissolution and repartnering dynamics on the pace of fertility decline. These analyses are based on lifetime fertility and nuptiality reports of women aged 40-49, born between 1940 and 1979.

The findings emerging in this study reveal that union dissolution and repartnering dynamics are important drivers of macro fertility patterns in SSA. The results confirmed **H1**, which postulated that a larger population size of women who experience union dissolution is associated with lower fertility at the population level. It is found that having two women in every five ever-married women who experience a union dissolution by the time they reach the end of the reproductive lifespan (the minimum average union dissolution rate (across birth cohorts) in 20/34 countries analyzed) is associated with an average reduction in CFS of 0.90. However, when remarriage is considered, only the percentage of women who do not remarry following a union dissolution, not the proportion of women who remarry, significantly affects fertility at the population level (**H1b** confirmed). For example, if 20% of ever-married women reach the end of their reproductive lifespan without remarrying following a first union dissolution (a minimum estimate for South Africa, Kenya, Zimbabwe, Rwanda and Lesotho), CFS is likely to be 0.78 lower, holding all other factors constant. This reduction is only 0.29 and not statistically significant if an equivalent percentage of women are married more than once by the end of their reproductive lifespan. These findings suggest that having a larger fraction of women who remarry following a union dissolution minimizes the reduction in population-level fertility, which could occur if union dissolution is not followed by remarriage. They also signal that country disparities in levels of union dissolution and remarriage rates are fundamental to cross-country fertility differences, as **H2** suggested. The results indeed revealed that country heterogeneity in union dissolution and repartnering rates explains 9.4% of the cross-country fertility differences in SSA. This contribution is far from negligible and is the same as the contribution attributable to urbanization, and about half that is explained by female participation in education.

The evidence regarding **H3,** which suggested that union dissolution and repartnering dynamics slowed the pace of fertility decline in SSA, is mixed. However, this hypothesis is confirmed in most countries, including the SSA region (as a whole). For the SSA region, fertility would have declined 1.24 times faster if union dissolution and repartnering rates and the effect of union dissolution and repartnering on fertility had remained the same as of women born 1940-49. Union dissolution rates declined over birth cohorts in SSA. Thus, given that the proportion of women who experience union dissolution is associated with lower fertility, this shift implied that fertility in recent birth cohorts has been higher than it would have been in the absence of shifts in union dissolution rates over birth cohorts. Furthermore, the fertility of women who experienced union dissolution declined more slowly than that of women in intact first unions (primarily driven by the pace of fertility decline among remarried women, who constitute the largest fraction of women who experienced union dissolution).

However, in Ghana, Kenya, Liberia, South Africa and Zimbabwe, shifts in union dissolution and repartnering rates or the effects of union dissolution and repartnering on fertility contributed to a faster fertility decline. Kenya, South Africa and Zimbabwe present interesting cases because of their unique union dissolution and repartnering patterns. Indeed, contrary to most SSA countries, remarriage rates following a union dissolution are relatively lower in these countries. Thus, the population of women who do not remarry following a union dissolution constitutes the largest fraction of women who experience a union dissolution. Fertility for this group declines faster than any other marital group, thus partly explaining the patterns documented in these countries. Moreover, union dissolution rates are rising in Kenya and Zimbabwe (John and Nitsche 2022, also see Fig.2), which implies that fertility in recent birth cohorts has been lower than it would have been in the absence of changes in union dissolution rates over birth cohorts. It is interesting to note that Kenya, South Africa and Zimbabwe are generally the forerunners of fertility decline in SSA, and the union dissolutions and repartnering patterns prevailing there parallel those observed in Latin America and the Caribbean, where fertility decline has been rapid (John, Adjiwanou et al. 2023).

The analyses discussed in this study have limitations inherent to the attributes of nuptiality reports collected in DHS. First, the variable capturing life course union dissolution and repartnering status used in this analysis is based on women's retrospective reports of marriage histories. Prior evaluation of such histories suggests that women tend to underreport marriages as they age (Mensch, Grant et al. 2006, Chae 2016). Thus, nuptiality reports of women aged 40-49 are likely affected by these recall/omission errors. Omission of marriages implies that the proportion of women who experienced union dissolution or remarried and the fertility gradient between marital states is likely underestimated. Thus, the strength of the association between union dissolution and repartnering rates and the magnitude of the influence of these events on fertility patterns reported in this paper is possibly underestimated.

Another concern with similar implications relates to a possible underreporting of union dissolution and remarriage rates and the effects of these events on fertility due to potentially higher mortality among women who experience union dissolution than their counterparts in intact first unions. This is most likely in this analysis given the HIV/AIDS pandemic, which hit most SSA countries from the 1980s until the mid-2000s (Frank, Carter et al. 2019, Gona, Gona et al. 2020). It is conceivable that women whose union ended because the husband died from HIV/AIDS died from HIV/AIDS themselves and, thus, were underrepresented at the time of the survey (leading to underestimation of union dissolutions due to the death of a spouse).

More relatedly, there is an issue of selection of women for marital dissolution and low fertility. For example, women with HIV or at risk of HIV infection due to the unfaithfulness of their partners are disproportionately at higher risk of experiencing marital dissolution (Porter, Hao et al. 2004, Anglewicz and Reniers 2014, Grant and Soler-Hampejsek 2014). HIV is negatively associated with lower fertility (Terceira, Gregson et al. 2003, Lewis, Ronsmans et al. 2004). The main models I specified do not account for HIV due to the lack of HIV information for each DHS survey included in this analysis. Nevertheless, for robustness, and particularly concerning the influence of marital dissolution and repartnering on the pace of fertility decline[6], I specified a model that accounts for HIV using a pooled data set of country-specific surveys for which HIV data was collected and is available for analysis. This analysis considered a sample of 53,596 women aged 40-49 from 25 countries born between 1955 and 1975. The findings (Appendix Table A6) yield the same conclusions discussed earlier in this paper. Nevertheless, the magnitude of the estimates drops slightly. For example, results for this analysis revealed that the pace of fertility decline would have been 1.21 times faster if union dissolution and repartnering rates and the fertility behaviour of women who experienced these events had remained the same as those of women born 1955-59 (note that the corresponding estimate for a model that does not account for HIV based on this pooled data is 1.23; Table A6). This finding suggests that selectivity for marital dissolution and low fertility among women exposed to HIV infection and changes in the HIV pandemic over birth cohorts do not fully explain the influence of marital dissolution and repartnering on macro fertility developments in SSA.

Another selection concern relates to infertility. Infertile women might be selected for a higher risk of union dissolution and low fertility. Indeed, the level of childlessness by the exact age of 40 for the pooled sample of women aged 40-49 considered in this paper is higher among women who experienced marital dissolution (3.38%) than those who remained in intact first unions (1.76%). However, the model which considered only women who had at least one birth as a proxy for accounting for primary infertility yielded the same conclusions (Table A6). Moreover, it is essential to note that John and Adjiwanou (2022) observed that women who experience marital dissolution tend to have higher or similar fertility levels compared to women who remain in intact first unions at early reproductive ages, thus suggesting that selection for infertility is less likely to fully explain the relationship between marital dissolution and fertility in this region. Besides, John and Adjiwanou (2022) also observed that women who experience marital dissolution are characterized by social and demographic attributes that select them for higher fertility rather than low fertility. In most countries, these women marry at a younger age, start childbearing sooner, have higher premarital fertility, and are more likely to be less educated and more likely to reside in rural areas than women who remain in intact first unions. Thus, it appears that it is not selection for marital dissolution and low fertility that explain the relationships documented in this paper.

However, it is important to note that I did not account for polygamy in the analytical models. Polygamy is a central feature of marriage regimes in SSA (Chae and Agadjanian 2022) that creates a marriage market for divorcees and widows. Chae and Agadjanian (2022), indeed, revealed that the risk of entering into a polygamous union is higher among remarrying women than among women forming their first unions. The relationship between polygyny and fertility is mostly negative (Garenne and Van de Walle 1989, Dodoo 1998, Lardoux and Van de Walle 2003).

[6] This robustness is not possible for the first and second parts of the analysis of this paper due to the limited sample size within countries. The data restriction applied (in the method section) for implementing the fixed effects linear models specified in this paper returned only 86 observations.

Nevertheless, it is not clear whether this relationship mainly arises because polygamous unions are dominated by women who have experienced marital dissolution and remarried or because polygyny itself reduces fertility. Johnson and Elmi (1989) study suggested that the former could be the case. They observed that the fertility of women in monogamous unions was not statistically different from that of women in polygamous unions who married only once. However, it was significantly higher compared to the fertility of women in polygamous unions who married more than once. Nevertheless, it is also possible that polygyny itself reduces fertility, in which case, the magnitude of the net fertility difference documented in this study might be somewhat overestimated. Unfortunately, information about polygyny in DHS is collected from women currently married at the time of the survey. Thus, it was impossible to specify women's lifetime experience of a polygamous union (to be consistent with the lifetime measures of union dissolution, repartnering and fertility used in the analyses), particularly among women whose first union ended and never remarried or those who married more than once. Thus, future studies that systematically investigate how polygamy modulates the relationships documented in this study or whether it is marital dissolution/repartnering that accounts for the negative relationship between polygamy and fertility are needed.

Notwithstanding the abovementioned caveats, this study contributes to the discussion of macro fertility patterns in SSA and beyond. It is clear from the findings that union dissolution and repartnering dynamics are important to macro fertility developments in this region and, thus, deserve attention. This emerging perspective calls to integrate union dissolution and repartnering dynamics in the analyses and discussion of the union-fertility nexus and fertility variation within and beyond the SSA region. For example, we should start questioning how the low and declining rates of union dissolution in South Asia, the high and rising union dissolution rates marked by low remarriage rates in Latin America and the Caribbean, and the high and declining union dissolution rates marked by high remarriage rates in SSA (Goldman 1981, Dommaraju and Jones 2011, Ruiz-Vallejo 2020, John, Adjiwanou et al. 2023) accounts for regularities and distinctions in fertility patterns across the global south. Moreover, this emerging perspective calls for a thorough empirical investigation of mechanisms linking union dissolution, repartnering and fertility. This paper highlighted a conceptual framework of this relationship, which can serve as a foundation for such analyses in future studies.

However, assessing the nitty-gritty aspects of the union dissolution, repartnering and fertility relationship requires compressive information about individuals' marriage histories. It requires information on whether a union ended, how it ended, whether new partnerships were formed and if so, when they were formed, how many unions individuals had during their reproductive years, how many children are born in various partnerships, and so forth. Unfortunately, such detailed marriage histories are missing in the most reliable and widely used nationally representative data sources – notably the DHS and the Multiple Indicator Cluster Surveys (MICS) data. Unavailability of these detailed marriage histories implies several shortcomings in studying the linkage between union dissolution, remarriage and fertility. For instance, it is problematic to perform comparable cross-national studies to assess, for example, how the contribution of the disruption and adaptation components to fertility variation compare and how the attributes of union dissolution and repartnering (e.g. timing, partner characterizes, marriage order, fertility in previous union etc.) shape fertility intentions, contraceptive use behavior, and fertility outcomes in higher-order unions. These questions are essential to further our understanding of the linkage between union dissolution, repartnering and fertility in SSA. Thus, the evidence emerging in this study calls for national governments and international organizations to consider funding the collection of these detailed marriage histories in nationally representative surveys in low- and middle-income countries. It is essential to note that such an investment has the potential to revolutionize not only scholarship on the union-fertility nexus in these countries but also scholarship on family demography and its intersection with social, health and demographic outcomes.

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TABLE 1 Measures

Measure category	Measure	Summary estimates (across 143 surveys)		
		25th percentiles	*Median*	*75th percentiles*
Fertility outcome	Mean number of children ever born at age 40	5.4	6.1	6.6
Union dissolution and repartnering dynamics	Percentage of women who ever experienced a union dissolution	32.9	42.3	48.5
	Percentage of women whose first union dissolved who did not remarry	8.2	13.1	17.2
	Percentage of women who ever remarried	20.3	28.4	35.3
Age at first marriage	Mean age at first marriage	18.1	19.2	20.3
Age at first birth	Mean age at first birth	19.5	20.1	20.9
Education	Percentage of women with primary education	13.9	24.4	47.2
	Percentage of women with secondary or higher education	4.8	10.2	23.6
Urbanization	Percentage of women residing in urban areas	18.0	30.0	40.0

Note

1. The summary estimates show the distribution of the measures across the 143 surveys included in this analysis. Country and survey-specific estimates (used to generate the summary measures) are calculated for ever-married women aged 40-49 at the survey, born between 1936 and 1982 (sampling weights apply). The sample excludes ever-married women with unknown information about lifetime union dissolution and repartnering status, women with unknown level of education and women with implausible age at first marriage (<10 years)

TABLE 2 Macro-level relationship between union dissolution, repartnering and fertility (mean children ever born at age 40)

	Country-level fixed-effects models			
	Model 1	**Model 2**	**Model 3**	**Model 4**
% Ever dissolved first union	0.0504***	-0.0275**	-0.0224**	
	(0.0131)	(0.0135)	(0.0096)	
% Married once-dissolved union				-0.0390***
				(0.0126)
% Ever remarried				-0.0145
				(0.0102)
Birth Cohort (1940-44) [ref]				
1945-49		0.0574	-0.0087	0.0149
		(0.1569)	(0.1352)	(0.1278)
1950-54		-0.1938	-0.0923	-0.0421
		(0.1691)	(0.1651)	(0.1581)
1955-59		-0.4190**	-0.2638	-0.1737
		(0.1876)	(0.2027)	(0.1865)
1960-64		-0.6967***	-0.3214	-0.2183
		(0.2025)	(0.2491)	(0.2304)
1965-69		-1.0712***	-0.5104*	-0.3933
		(0.2093)	(0.2898)	(0.2659)
1970-74		-1.4044***	-0.7115**	-0.6112**
		(0.2324)	(0.3039)	(0.2833)
1975-79		-1.7029***	-0.9716***	-0.8623***
		(0.2704)	(0.3050)	(0.2807)
Mean age at first marriage			-0.0712	-0.0471
			(0.0515)	(0.0584)
Mean age at first birth			-0.3155***	-0.3033***
			(0.0672)	(0.0628)
% With primary education			-0.0060	-0.0074
			(0.0065)	(0.0065)
% With secondary+ education			-0.0204***	-0.0228***
			(0.0071)	(0.0066)
% Residing in urban area			0.0092	0.0113*
			(0.0064)	(0.0057)
Constant	3.8754***	7.8304***	15.2154***	14.4463***
	(0.5350)	(0.6408)	(1.2941)	(1.3040)
Observations	205	205	205	205
R-squared	0.2018	0.7181	0.8276	0.8358
Number of countries	34	34	34	34

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

TABLE 3 Fertility (mean children ever born by age 40) by birth cohort, and pace of fertility decline (over 1950-54 through 1970-74 birth cohorts), under different union dissolution and repartnering conditions, for sub-Saharan Africa region as a whole.

Scenarios	Fertility (Mean children ever born by age 40) by birth cohort							Pace of fertility decline	
	1940-49	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	Pace	Relative Ratio (Expected / Observed)
Observed	6.74	6.47	6.29	6.06	5.79	5.58	5.29	-45.6	
Scenario 1	7.21	6.90	6.72	6.45	6.10	5.84	5.49	-54.7	1.20
Scenario 2	6.70	6.48	6.27	5.97	5.67	5.44	5.15	-53.6	1.18
Scenario 3		6.48	6.30	6.06	5.77	5.52	5.23	-48.9	1.07
Scenario 4		6.55	6.33	6.03	5.75	5.50	5.23	-53.4	1.17
Scenario 5		6.56	6.34	6.03	5.73	5.45	5.17	-56.7	1.24

Notes:

1. Scenarios defined as in Figure 4
2. The pace of fertility decline is measured as the change in Complete Family Size per 1000 women for a unit increase in birth year. It is estimated by fitting the slope to fertility estimates corresponding to 1950-54 through 1970-74 birth cohorts, using the mid-point of each cohort as a reference year of birth – i.e. for example, assuming that fertility estimates for the 1950-54 cohort correspond to women born 1952.5.
3. The relative ratio of the pace of fertility decline for Scenario 5 is 1.20 when the 1975-79 fertility estimates are considered.

FIGURE 1 A conceptual framework linking union dissolution, repartnering and fertility

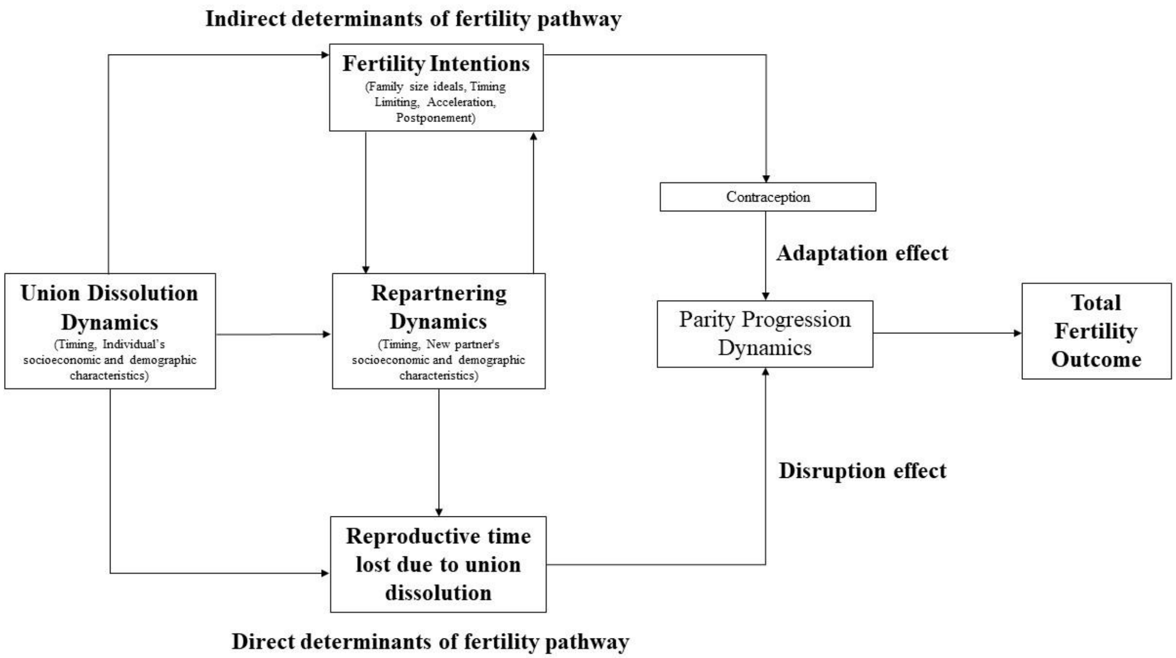


FIGURE 2 Cohort changes in union dissolution, repartnering and fertility rates.

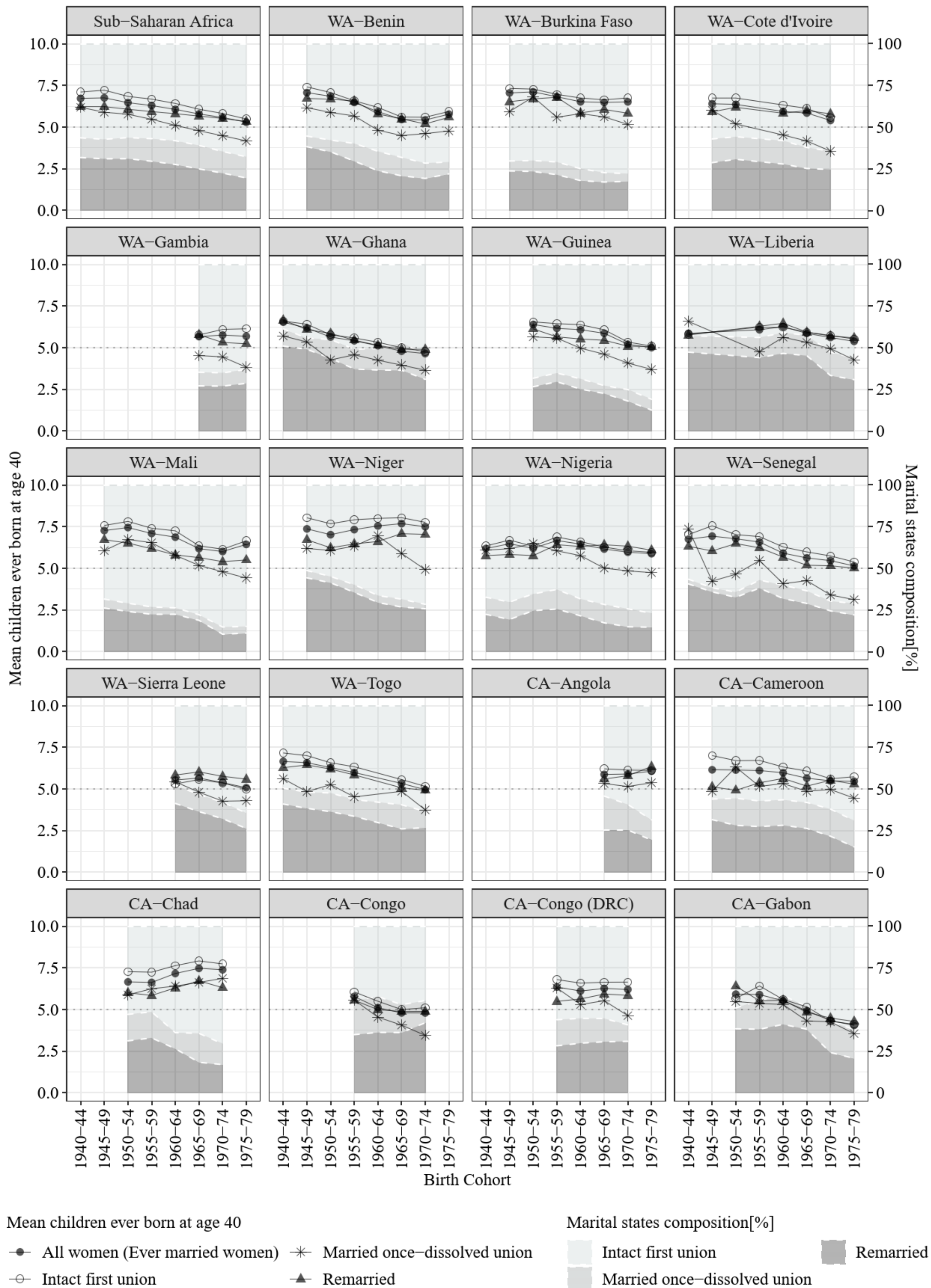
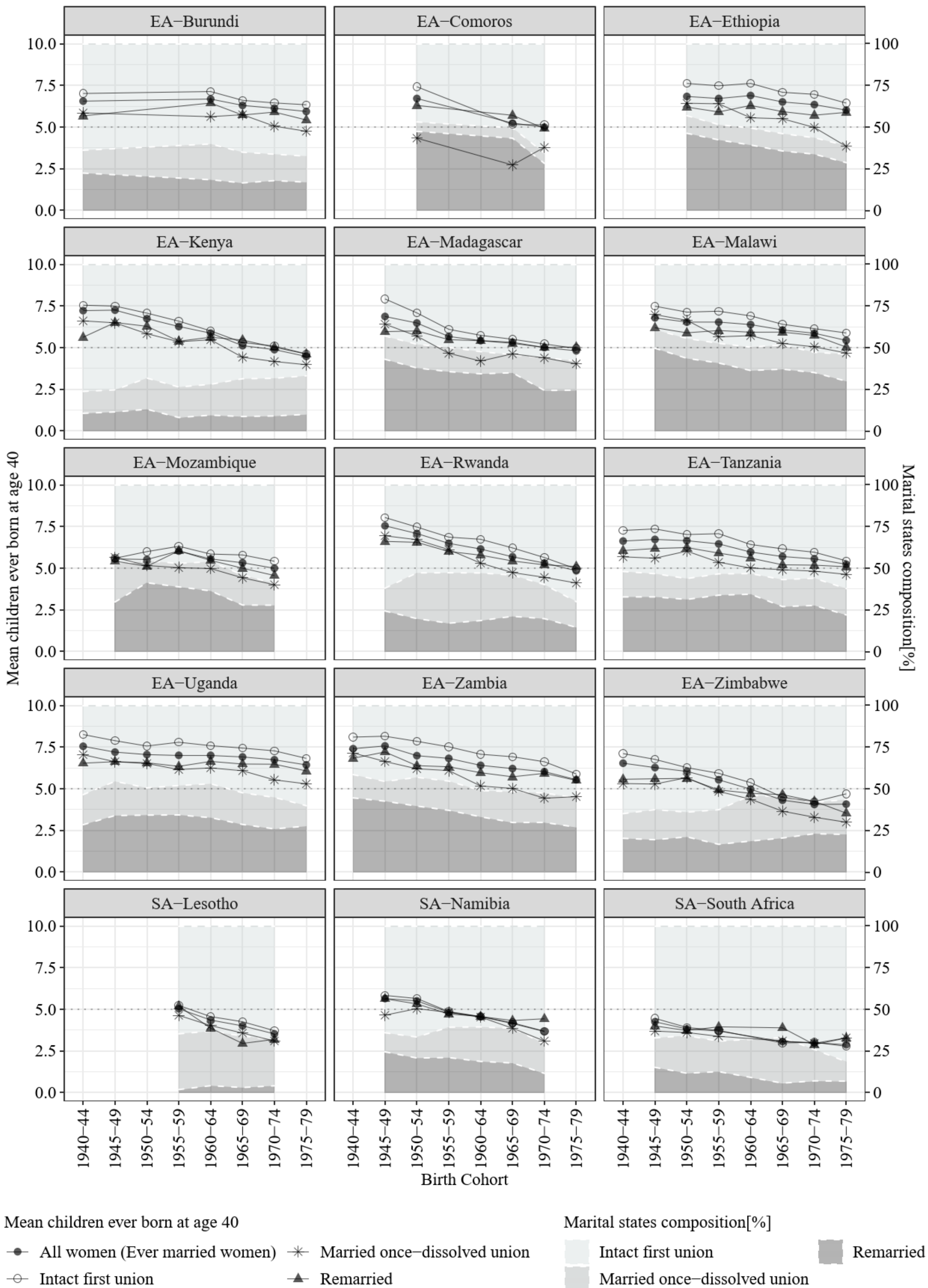


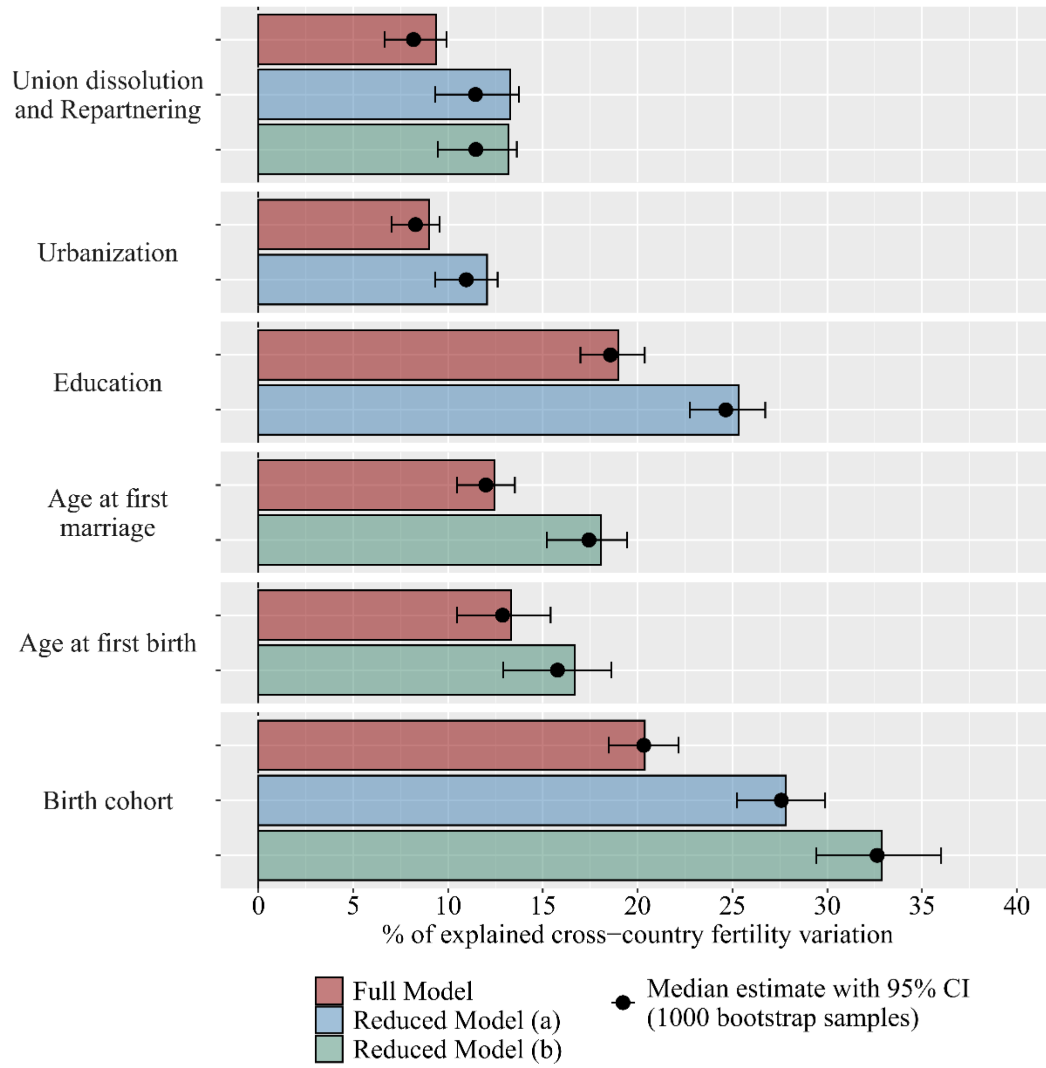
FIGURE 2 Continued



Notes:

1. WE refers to countries in West Africa
2. CA refers to countries in Central Africa
3. EA refers to countries in East Africa
4. SA refers to countries in Southern Africa

FIGURE 3 Hierarchical partitioned R^2 for different predictors of fertility rate (mean number of children ever born at age 40) at the macro-level.



Notes

1. **Full Model** estimates relate to hierarchical partitioning of R^2 for the full model (Model 4 in Table 2). The total explained cross-county fertility variation is 83.6%.
2. **Reduced Model (a)** estimates relate to hierarchical partitioning of R^2 for a model that excludes age at first marriage and age at first birth from the full model. The total explained cross-county fertility variation is 78.5%.
3. **Reduced Model (a)** estimates relate to hierarchical partitioning of R^2 for a model that excludes education and urbanization from the full model. The total explained cross-county fertility variation is 80.8%.

FIGURE 4 Relative fertility difference [(Expected/Observed – 1) × 100] under different counterfactual union dissolution and repartnering conditions.

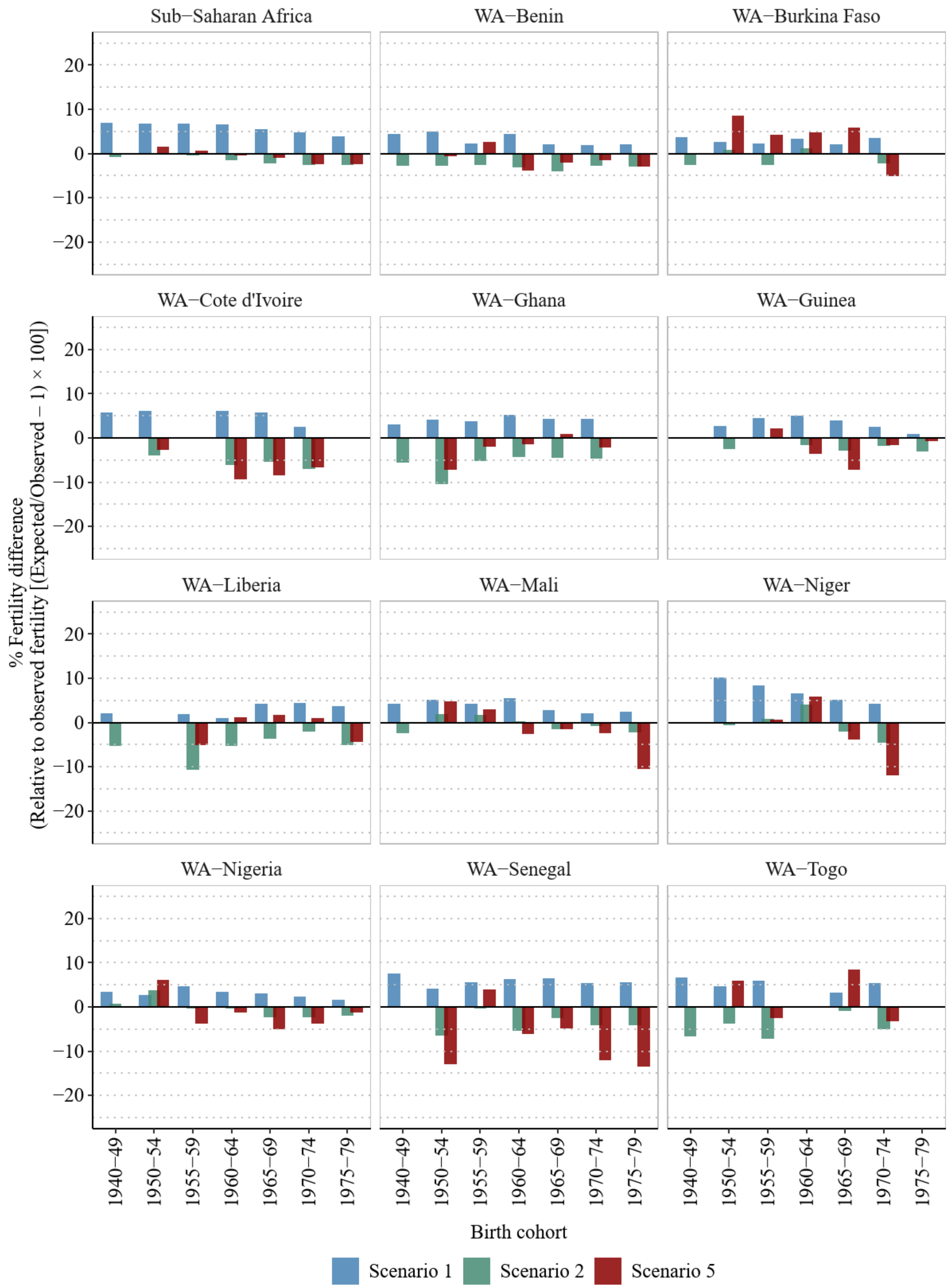
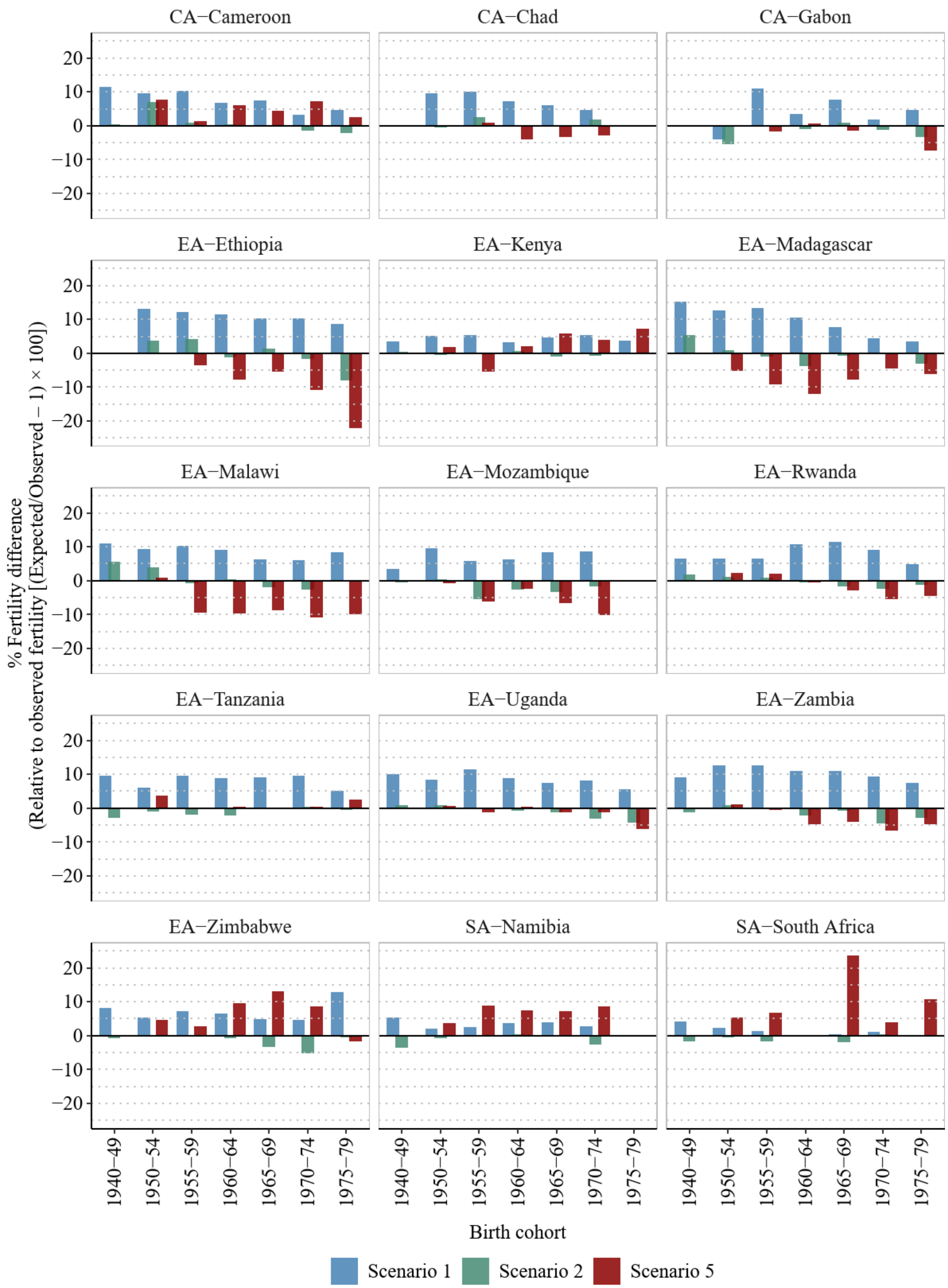


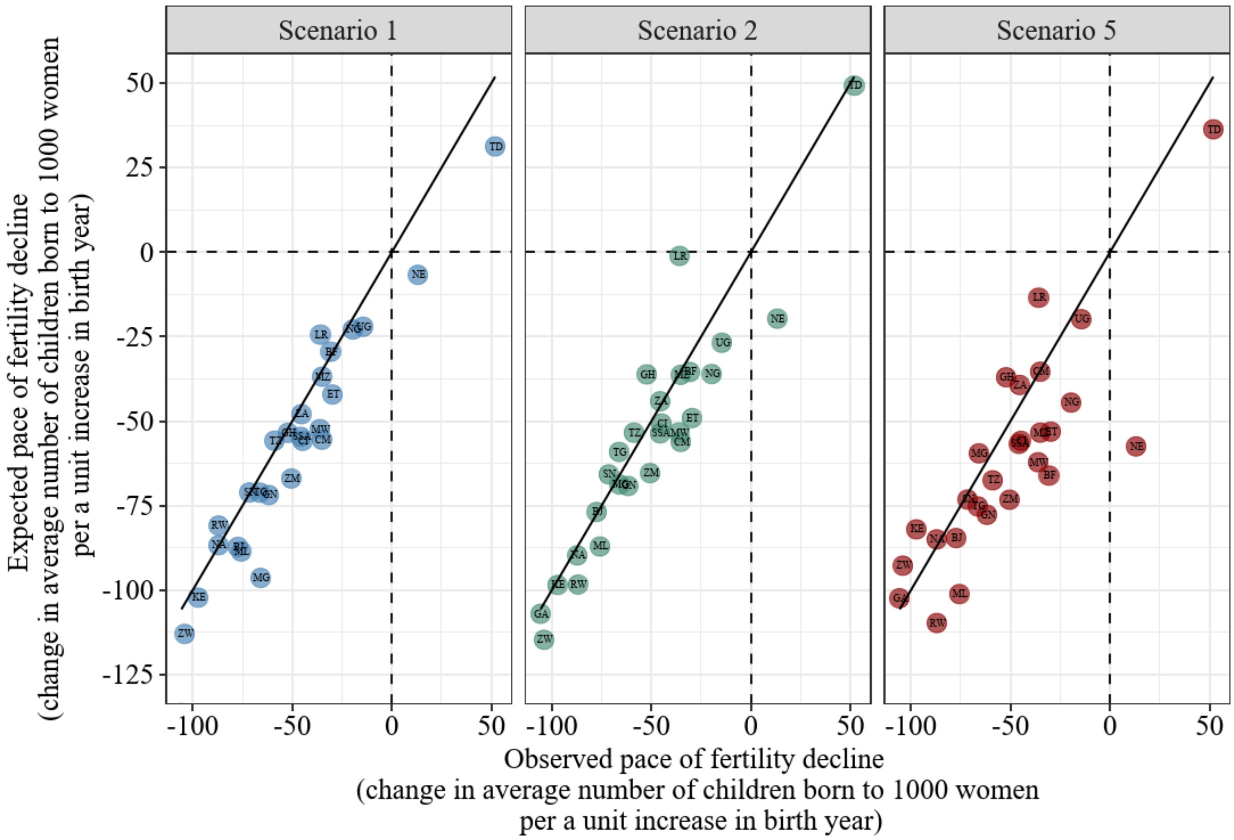
FIGURE 4 Continued



Notes

1. Scenario 1. No union dissolution
2. Scenario 2: No repartnering following union dissolution
3. Scenario 3 (results in Appendix Table A5): Union dissolution and repartnering rates remained the same as those of women born 1940-49 (1950-54 for Chad, Ethiopia, Gabon, Guinea and Niger)
4. Scenario 4 (results in Appendix Table A5): The effect of union dissolution and repartnering on fertility remained the same as those of women born 1940-49 (1950-54 for Chad, Ethiopia, Gabon, Guinea and Niger)
5. Scenario 5: Both scenarios 3 and 4 prevailed
6. WE (West Africa), CA (Central Africa), EA (East Africa), SA (Southern Africa)

FIGURE 5 Comparison of the observed pace of fertility decline and expected pace of fertility decline under different counterfactual union dissolution and repartnering conditions



Notes

1. Scenario 1. No union dissolution
2. Scenario 2: No repartnering following union dissolution
3. Scenario 3 (results in Appendix Table A5): Union dissolution and repartnering rates remained the same as those of women born 1940-49 (1950-54 for Chad, Ethiopia, Gabon, Guinea and Niger)
4. Scenario 4 (results in Appendix Table A5): The effect of union dissolution and repartnering on fertility remained the same as those of women born 1940-49 (1950-54 for Chad, Ethiopia, Gabon, Guinea and Niger)
5. Scenario 5: Both scenarios 3 and 4 prevailed
6. Appendix Table A5 shows the expected fertility rates and pace of fertility decline for all five scenarios.
7. Country codes**:** **SSA**(Sub-Saharan Africa), **BJ**(Benin), **BF**(Burkina Faso), **CM**(Cameroon) , **TD**(Chad), **CI**(Cote d'Ivoire), **ET**(Ethiopia), **GA**(Gabon), **GH**(Ghana), **GN**(Guinea), **KE**(Kenya), **LR**(Liberia), **MG**(Madagascar), **MW**(Malawi), **ML**(Mali), **MZ**(Mozambique), **NA**(Namibia), **NE**(Niger), **NG**(Nigeria), **RW**(Rwanda), **SN**(Senegal), **ZA**(South Africa), **TZ**(Tanzania), **TG**(Togo), **UG**(Uganda), **ZM**(Zambia), **ZW**(Zimbabwe)

Appendixes

TABLE A1 DHS surveys included in the analysis according to region

Region and country	Year of survey							N
	Survey 1	Survey 2	Survey 3	Survey 4	Survey 5	Survey 6	Survey 7	
West Africa (WA)								**59**
Benin	1996	2001	2006	2011-12	2017-18			5
Burkina Faso	1992-93	1998-99	2003	2010				4
Cote d'Ivoire	1994	1998-99	2011-12					3
Gambia	2013	2019-20						2
Ghana	1988	1993-94	1998-99	2003	2008	2014		6
Guinea	1999	2005	2012	2018				4
Liberia	1986	2006-07	2013	2019-20				4
Mali	1995-96	2001	2006	2012-13	2018			5
Niger	1992	1998	2006	2012				4
Nigeria	1990	2003	2008	2013	2018			5
Senegal*	1986	1992-93	2005	2010-11	2012-13	2014		11
Sierra Leone	2008	2013	2019					3
Togo	1988	1998	2013-14					3
Central Africa (CA)								**16**
Angola	2015-16							1
Cameroon	1991	1998	2004	2011	2018-19			5
Chad	1996-97	2004	2014-15					3
Congo	2005	2011-12						2
Congo (DRC)	2007	2013-14						2
Gabon	2000-01	2012	2019-21					3
East and South Africa (EA & SA)								**68**
Burundi	1987	2010-11	2016-17					3
Comoros	1996	2012						2
Ethiopia	2000	2005	2011	2016				4
Kenya	1988-89	1993	1998	2003	2008-09	2014	2022	7
Madagascar	1992	1997	2003-04	2008-09	2021			5
Malawi	1992	2000	2004-05	2010	2015-16			5
Mozambique	1997	2003-04	2011					3
Rwanda	1992	2000	2005	2010-11	2014-15	2019-20		6
Tanzania	1991-92	1996	1999	2004-05	2009-10	2015-16		6
Uganda	1988-89	1995	2000-01	2006	2011	2016		6
Zambia	1992	1996-97	2001-02	2007	2013-14	2018-19		6
Zimbabwe	1988-89	1994	1999	2005-06	2010-11	2015		6
Lesotho	2004-05	2009-10	2014					3
Namibia	1992	2000	2006-07	2013				4
South Africa	1998	2016						2
SSA								**143**

* Senegal has a continuous DHS program – they have conducted DHS every year since 2014

TABLE A2 Comparison of Mean Children Ever Born (MCEB) at ages 40, 45 and 49 among women aged 45-49 at the survey

	Women aged 45-49 at survey			Women aged 49 at survey		
	Sample size	MCEB at age 45	% of fertility attained by age 40	Sample size	MCEB at age 49	% of fertility attained by age 40
Angola	797	6.2	93.0	137	6.4	90.1
Benin	4642	6.3	94.3	707	6.7	93.1
Burkina Faso	3228	7.3	93.7	529	7.5	92.0
Burundi	2113	6.9	92.9	337	7.0	90.7
Cameroon	3291	6.1	95.8	563	6.2	94.4
Chad	2405	7.4	95.5	383	7.6	95.0
Comoros	513	6.1	95.5	75	7.1	93.8
Congo	1253	5.6	96.2	234	6.1	95.3
Congo (DRC)	1975	6.7	93.6	434	7.1	92.4
Cote d'Ivoire	1319	6.5	94.5	221	6.8	92.7
Ethiopia	4350	7.1	94.6	565	7.4	93.2
Gabon	1833	5.1	96.3	329	5.1	96.0
Gambia	1291	6.1	94.6	221	6.0	91.9
Ghana	2920	5.8	94.1	426	5.9	93.0
Guinea	3067	6.1	94.0	514	6.7	91.7
Kenya	7141	5.7	96.2	1109	6.1	95.2
Lesotho	1651	4.6	96.3	303	4.7	95.9
Liberia	2484	6.4	93.6	465	6.8	90.7
Madagascar	4264	5.8	95.1	666	5.9	94.1
Malawi	5170	6.7	94.4	891	7.1	91.7
Mali	4123	7.2	94.1	557	7.4	91.5
Mozambique	2553	6.0	93.8	483	6.5	90.9
Namibia	1856	5.1	94.8	335	5.1	94.0
Niger	2276	7.9	93.7	274	8.8	89.3
Nigeria	11397	6.7	94.5	2101	7.0	92.8
Rwanda	5127	6.5	93.8	963	6.6	92.4
Senegal	6913	6.2	94.0	957	6.3	91.6
Sierra Leone	3112	5.8	94.0	437	6.2	91.4
South Africa	1494	3.8	96.4	234	3.5	96.9
Tanzania	4097	6.6	94.4	653	6.9	92.3
Togo	1692	6.3	93.6	210	6.6	90.9
Uganda	3344	7.4	95.1	519	7.4	92.8
Zambia	3785	7.0	94.9	742	6.9	94.0
Zimbabwe	2875	5.6	96.0	454	5.9	94.2
sub-Saharan Africa	**110351**	**6.4**	**94.5**	**18028**	**6.6**	**92.8**

TABLE A3 Macro-level relationship between union dissolution, repartnering and fertility (mean number of children ever born at age 40)

	Country-level fixed-effects models			Ordinary Least Squares (OLS) regression models†			
	MCEB (40)	MCEB (45)		MCEB (40)		MCEB (45)	
	n<=100	*n<=100*	*n<=200*	*n<=100*	*n<=200*	*n<=100*	*n<=200*
% Married once- dissolved first union	-0.0341**	-0.0293**	-0.0332*	-0.0341**	-0.0390***	-0.0293**	-0.0332*
	(0.0130)	(0.0122)	(0.0168)	(0.0142)	(0.0139)	(0.0137)	(0.0192)
% Ever remarried	-0.0047	-0.0089	-0.0155	-0.0047	-0.0145	-0.0089	-0.0155
	(0.0086)	(0.0098)	(0.0122)	(0.0094)	(0.0112)	(0.0110)	(0.0140)
Birth cohort (1940-44) [ref]							
1945-49	-0.0822	-0.1060	-0.1589	-0.0822	0.0149	-0.1060	-0.1589
	(0.0760)	(0.0849)	(0.1204)	(0.0830)	(0.1405)	(0.0952)	(0.1375)
1950-54	-0.0725	-0.0847	-0.1513	-0.0725	-0.0421	-0.0847	-0.1513
	(0.1270)	(0.0985)	(0.1481)	(0.1387)	(0.1739)	(0.1104)	(0.1692)
1955-59	-0.1800	-0.2352*	-0.3299*	-0.1800	-0.1737	-0.2352	-0.3299
	(0.1564)	(0.1367)	(0.1838)	(0.1708)	(0.2051)	(0.1533)	(0.2100)
1960-64	-0.2189	-0.2802	-0.3695	-0.2189	-0.2183	-0.2802	-0.3695
	(0.2038)	(0.1918)	(0.2422)	(0.2226)	(0.2535)	(0.2151)	(0.2768)
1965-69	-0.3562	-0.4703*	-0.5799**	-0.3562	-0.3933	-0.4703*	-0.5799*
	(0.2583)	(0.2417)	(0.2751)	(0.2821)	(0.2925)	(0.2710)	(0.3144)
1970-74	-0.5457*	-0.5790**	-0.7151**	-0.5457*	-0.6112*	-0.5790*	-0.7151**
	(0.2750)	(0.2538)	(0.2815)	(0.3003)	(0.3117)	(0.2846)	(0.3216)
1975-79	-0.7314**			-0.7314**	-0.8623***		
	(0.2808)			(0.3067)	(0.3087)		
Mean age at first marriage	-0.0301	-0.0767	-0.0863	-0.0301	-0.0471	-0.0767	-0.0863
	(0.0601)	(0.0636)	(0.0680)	(0.0656)	(0.0643)	(0.0713)	(0.0777)

TABLE A3 Continued

	Country-level fixed-effects models			Ordinary Least Squares (OLS) regression models†			
	MCEB (40)	MCEB (45)		MCEB (40)		MCEB (45)	
	n<=100	*n<=100*	*n<=200*	*n<=100*	*n<=200*	*n<=100*	*n<=200*
Mean age at first birth	-0.3001***	-0.2862***	-0.3278***	-0.3001***	-0.3033***	-0.2862***	-0.3278***
	(0.0658)	(0.0611)	(0.0783)	(0.0719)	(0.0691)	(0.0685)	(0.0894)
% With primary education	-0.0066	-0.0043	-0.0027	-0.0066	-0.0074	-0.0043	-0.0027
	(0.0064)	(0.0066)	(0.0073)	(0.0070)	(0.0072)	(0.0074)	(0.0084)
% With secondary+ education	-0.0253***	-0.0296***	-0.0253***	-0.0253***	-0.0228***	-0.0296***	-0.0253**
	(0.0069)	(0.0072)	(0.0093)	(0.0075)	(0.0072)	(0.0081)	(0.0106)
% Residing in urban area	0.0109*	0.0172**	0.0131*	0.0109	0.0113*	0.0172**	0.0131
	(0.0062)	(0.0064)	(0.0069)	(0.0068)	(0.0063)	(0.0072)	(0.0078)
				(0.2417)	(0.2400)	(0.2610)	(0.3276)
Constant	13.7428***	14.7415***	16.0940***	14.1565***	14.9280***	14.9676***	16.4786***
	(1.3174)	(1.5658)	(1.6793)	(1.5823)	(1.5411)	(1.9283)	(2.0377)
Observations	219	175	155	219	205	175	155
R-squared	0.8115	0.7754	0.7843	0.9347	0.9433	0.9239	0.9308
Number of countries	34	34	34				

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

† models include country as a control variable

n = minimum sample size per birth cohort

TABLE A4 Bivariate and Hierarchical partitioned R^2 for different predictors of fertility rate (mean number of children ever born at age 40) at the macro-level.

Variables	Bivariate -squared				Hierarchical Partitioned R-squared											
					Full Model				Reduced Model (a)				Reduced Model (b)			
	Observed Estimate	Bootstrap Estimates			Observed	Bootstrap Estimates			Observed	Bootstrap Estimates			Observed	Bootstrap Estimates		
		Median	95% CI		Estimate	Median	95% CI		Estimate	Median	95% CI		Estimate	Median	95% CI	
Union dissolution and Repartnering	37.2	32.1	(26.2	38.4)	9.4	8.2	(6.6	9.9)	13.3	11.4	(9.3	13.7)	13.2	11.5	(9.5	13.6)
Education	65.7	61.8	(58.3	65.5)	19.0	18.6	(17	20.4)	25.3	24.6	(22.7	26.7)				
Age at first marriage	56.1	51.6	(46.3	56.5)	12.4	12.0	(10.5	13.5)					18.1	17.4	(15.2	19.4)
Age at first birth	42.6	38.2	(31.9	44.3)	13.3	12.9	(10.5	15.4)					16.7	15.8	(12.9	18.6)
Urbanization	39.6	35.1	(30.1	40.5)	9.0	8.3	(7	9.6)	12.1	11.0	(9.3	12.6)				
Birth cohort	68.6	65.5	(61.6	68.9)	20.4	20.3	(18.5	22.2)	27.8	27.6	(25.2	29.9)	32.9	32.6	(29.4	36)
Total R-square					**83.5**	**80.4**	**(77.8**	**82.8)**	**78.5**	**74.7**	**(71.6**	**77.4)**	**80.8**	**77.4**	**(74.2**	**80.1)**

Notes

4. **Full Model** estimates relate to hierarchical partitioning of R^2 for the full model (Model 4 in Table 2). The total explained cross-county fertility variation is 83.6%.
5. **Reduced Model (a)** estimates relate to hierarchical partitioning of R^2 for a model that excludes age at first marriage and age at first birth from the full model. The total explained cross-county fertility variation is 78.5%.
6. **Reduced Model (a)** estimates relate to hierarchical partitioning of R^2 for a model that excludes education and urbanization from the full model. The total explained cross-county fertility variation is 80.8%.

TABLE A5 Fertility (mean number of children ever born at age 40) by birth cohort, and pace of fertility decline (over 1950-54 through 1970-74 birth cohorts), under different union dissolution and repartnering conditions.

Country (Region) and Scenario	Fertility (Mean Children Ever Born by age 40)							Pace of fertility decline
	1940-49	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	
Sub-Saharan Africa								
Observed	6.74	6.47	6.29	6.06	5.79	5.58	5.29	-45.6
Scenario 1	7.21	6.90	6.72	6.45	6.10	5.84	5.49	-54.7
Scenario 2	6.70	6.48	6.27	5.97	5.67	5.44	5.15	-53.6
Scenario 3		6.48	6.30	6.06	5.77	5.52	5.23	-48.9
Scenario 4		6.55	6.33	6.03	5.75	5.50	5.23	-53.4
Scenario 5		6.56	6.34	6.03	5.73	5.45	5.17	-56.7
Benin								
Observed	7.07	6.85	6.48	5.93	5.46	5.42	5.78	-77.4
Scenario 1	7.37	7.18	6.61	6.18	5.57	5.53	5.89	-87.2
Scenario 2	6.88	6.67	6.32	5.75	5.25	5.28	5.61	-76.9
Scenario 3		6.82	6.51	5.94	5.57	5.44	5.74	-74.0
Scenario 4		6.84	6.61	5.69	5.25	5.32	5.65	-87.9
Scenario 5		6.81	6.64	5.70	5.35	5.34	5.61	-84.6
Burkina Faso								
Observed	7.06	7.11	6.82	6.52	6.48	6.51		-30.7
Scenario 1	7.31	7.30	6.97	6.72	6.61	6.74		-29.5
Scenario 2	6.89	7.17	6.66	6.59	6.48	6.37		-35.4
Scenario 3		7.10	6.84	6.42	6.41	6.42		-36.0
Scenario 4		7.72	7.08	6.92	6.93	6.27		-60.7
Scenario 5		7.72	7.10	6.82	6.86	6.18		-66.1
Cameroon								
Observed	6.12	6.13	6.10	5.97	5.64	5.48	5.46	-35.1
Scenario 1	6.81	6.71	6.72	6.37	6.05	5.66	5.70	-55.5
Scenario 2	6.16	6.56	6.16	6.00	5.65	5.40	5.35	-56.1
Scenario 3		6.10	6.09	5.97	5.62	5.48	5.41	-33.9
Scenario 4		6.64	6.21	6.32	5.91	5.87	5.64	-36.6
Scenario 5		6.60	6.20	6.32	5.88	5.87	5.59	-35.4
Chad								
Observed		6.66	6.62	7.16	7.47	7.38		51.9
Scenario 1		7.29	7.27	7.66	7.91	7.71		31.3
Scenario 2		6.63	6.78	7.16	7.46	7.50		49.3
Scenario 3			6.68	6.86	7.14	6.91		19.8
Scenario 4			6.64	7.19	7.56	7.66		68.5
Scenario 5			6.69	6.89	7.23	7.18		36.3
Cote d'Ivoire								
Observed	6.40	6.36		5.94	5.84	5.40		-44.9
Scenario 1	6.76	6.74		6.30	6.17	5.53		-55.8
Scenario 2	6.39	6.12		5.58	5.54	5.02		-50.7
Scenario 3		6.37		5.92	5.76	5.31		-50.1
Scenario 4		6.19		5.40	5.44	5.13		-50.7
Scenario 5		6.19		5.39	5.35	5.04		-55.8

Country (Region) and Scenario	Fertility (Mean Children Ever Born by age 40)							Pace of fertility decline
	1940-49	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	
Ethiopia								
Observed		6.84	6.71	6.89	6.51	6.35	6.02	-29.8
Scenario 1		7.72	7.53	7.68	7.17	6.99	6.53	-42.1
Scenario 2		7.09	6.99	6.81	6.60	6.25	5.54	-49.1
Scenario 3			6.41	6.77	6.25	6.04	5.76	-32.3
Scenario 4			6.78	6.49	6.41	5.97	4.96	-50.6
Scenario 5			6.48	6.37	6.16	5.66	4.70	-53.1
Gabon								
Observed		5.92	5.89	5.53	4.92	4.33	4.05	-105.7
Scenario 1		5.68	6.54	5.71	5.30	4.41	4.23	-136.4
Scenario 2		5.60	5.90	5.47	4.97	4.28	3.92	-107.0
Scenario 3			6.00	5.58	4.93	4.35	4.07	-112.2
Scenario 4			5.70	5.51	4.84	4.32	3.73	-95.9
Scenario 5			5.80	5.57	4.85	4.33	3.76	-102.4
Ghana								
Observed	6.30	5.64	5.41	5.12	4.79	4.65		-52.2
Scenario 1	6.49	5.87	5.62	5.38	4.99	4.85		-53.5
Scenario 2	5.95	5.06	5.13	4.90	4.58	4.43		-36.2
Scenario 3		5.73	5.44	5.12	4.88	4.70		-52.4
Scenario 4		5.15	5.29	5.05	4.75	4.50		-36.9
Scenario 5		5.24	5.31	5.05	4.83	4.55		-37.0
Guinea								
Observed		6.39	6.16	6.08	5.86	5.20	5.00	-61.7
Scenario 1		6.55	6.43	6.37	6.09	5.33	5.05	-71.8
Scenario 2		6.24	6.17	5.99	5.70	5.11	4.86	-69.2
Scenario 3			6.21	6.08	5.80	5.18	5.08	-67.3
Scenario 4			6.24	5.86	5.52	5.15	4.89	-72.1
Scenario 5			6.29	5.86	5.45	5.13	4.96	-77.7
Kenya								
Observed	7.24	6.74	6.27	5.87	5.12	4.88	4.47	-97.3
Scenario 1	7.49	7.07	6.59	6.06	5.35	5.13	4.64	-102.2
Scenario 2	7.27	6.70	6.27	5.91	5.07	4.84	4.46	-98.5
Scenario 3		6.88	6.31	5.89	5.28	5.05	4.58	-93.7
Scenario 4		6.70	5.90	5.96	5.24	4.88	4.69	-85.5
Scenario 5		6.84	5.94	5.98	5.41	5.06	4.79	-82.0
Liberia								
Observed	5.92		6.08	6.26	5.86	5.61	5.38	-35.8
Scenario 1	6.05		6.18	6.32	6.10	5.85	5.57	-24.4
Scenario 2	5.62		5.43	5.93	5.65	5.51	5.11	-1.1
Scenario 3			6.14	6.29	5.89	5.58	5.40	-42.2
Scenario 4			5.70	6.30	5.91	5.71	5.13	-7.1
Scenario 5			5.77	6.33	5.95	5.67	5.15	-13.5
Madagascar								
Observed	6.84	6.48	5.67	5.42	5.32	5.00	4.81	-65.9
Scenario 1	7.87	7.29	6.41	5.98	5.73	5.22	4.97	-96.3
Scenario 2	7.20	6.54	5.61	5.22	5.29	4.99	4.67	-68.7
Scenario 3		6.32	5.47	5.21	5.11	4.89	4.80	-64.5
Scenario 4		6.30	5.34	4.98	5.12	4.89	4.52	-61.0
Scenario 5		6.15	5.15	4.77	4.91	4.78	4.51	-59.5

Country (Region) and Scenario	Fertility (Mean Children Ever Born by age 40)							Pace of fertility decline
	1940-49	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	
Malawi								
Observed	6.71	6.53	6.53	6.38	6.06	5.86	5.43	-36.1
Scenario 1	7.44	7.13	7.20	6.95	6.43	6.20	5.88	-52.4
Scenario 2	7.07	6.78	6.48	6.41	5.94	5.72	5.41	-53.4
Scenario 3		6.63	6.29	6.04	5.98	5.73	5.23	-42.4
Scenario 4		6.49	6.16	6.11	5.62	5.37	5.10	-55.9
Scenario 5		6.59	5.92	5.77	5.53	5.23	4.90	-62.2
Mali								
Observed	7.26	7.44	7.09	6.87	6.18	6.01	6.43	-75.7
Scenario 1	7.57	7.82	7.39	7.24	6.35	6.13	6.59	-88.6
Scenario 2	7.10	7.58	7.20	6.88	6.09	5.96	6.29	-87.1
Scenario 3		7.38	6.99	6.73	6.04	5.78	6.19	-83.1
Scenario 4		7.86	7.39	6.83	6.23	6.09	6.00	-93.8
Scenario 5		7.79	7.29	6.70	6.09	5.86	5.76	-101.1
Mozambique								
Observed	5.56	5.52	6.03	5.55	5.32	4.99		-35.1
Scenario 1	5.74	6.04	6.36	5.90	5.77	5.41		-36.8
Scenario 2	5.52	5.55	5.70	5.42	5.15	4.92		-36.3
Scenario 3		5.57	5.84	5.53	5.18	4.76		-45.6
Scenario 4		5.43	5.85	5.46	5.12	4.73		-42.8
Scenario 5		5.48	5.66	5.43	4.97	4.49		-53.4
Namibia								
Observed	5.57	5.50	4.82	4.56	4.14	3.66		-87.1
Scenario 1	5.87	5.61	4.94	4.72	4.30	3.76		-86.7
Scenario 2	5.37	5.47	4.84	4.57	4.13	3.58		-89.7
Scenario 3		5.30	4.83	4.56	4.16	3.76		-75.0
Scenario 4		5.90	5.24	4.89	4.42	3.89		-97.1
Scenario 5		5.70	5.25	4.89	4.44	3.98		-85.0
Niger								
Observed		7.02	7.32	7.54	7.68	7.50		13.1
Scenario 1		7.72	7.92	8.03	8.06	7.80		-6.7
Scenario 2		6.98	7.38	7.84	7.53	7.15		-19.7
Scenario 3			7.16	7.26	7.46	7.19		5.8
Scenario 4			7.53	8.25	7.61	6.90		-50.1
Scenario 5			7.36	7.97	7.39	6.60		-57.5
Nigeria								
Observed	6.37	6.20	6.66	6.45	6.16	5.96	5.88	-19.6
Scenario 1	6.58	6.36	6.97	6.67	6.34	6.10	5.96	-22.9
Scenario 2	6.41	6.42	6.64	6.43	6.01	5.83	5.77	-36.1
Scenario 3		6.25	6.61	6.46	6.15	5.96	5.83	-20.8
Scenario 4		6.52	6.48	6.37	5.85	5.75	5.85	-43.2
Scenario 5		6.57	6.42	6.38	5.85	5.74	5.81	-44.5
Rwanda								
Observed	7.48	7.08	6.49	6.15	5.68	5.31	4.84	-87.0
Scenario 1	7.96	7.53	6.90	6.80	6.33	5.79	5.08	-80.9
Scenario 2	7.60	7.16	6.55	6.12	5.59	5.18	4.78	-98.3
Scenario 3		7.17	6.56	6.42	5.96	5.44	4.77	-81.1
Scenario 4		7.14	6.55	5.84	5.25	4.90	4.71	-115.6
Scenario 5		7.23	6.62	6.12	5.53	5.03	4.63	-109.7

Country (Region) and Scenario	Fertility (Mean Children Ever Born by age 40)							Pace of fertility decline
	1940-49	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	
Senegal								
Observed	6.85	6.77	6.58	5.91	5.62	5.46	5.14	-71.5
Scenario 1	7.36	7.04	6.94	6.27	5.98	5.75	5.42	-71.1
Scenario 2	6.84	6.34	6.55	5.59	5.48	5.23	4.94	-65.7
Scenario 3		6.72	6.62	6.01	5.61	5.38	5.07	-73.5
Scenario 4		5.95	6.79	5.45	5.36	4.88	4.53	-71.2
Scenario 5		5.90	6.83	5.56	5.35	4.81	4.45	-73.2
South Africa								
Observed	4.25	3.82	3.69		3.06	2.99	2.87	-45.5
Scenario 1	4.43	3.90	3.74		3.08	3.03	2.86	-47.9
Scenario 2	4.18	3.79	3.63		3.00	3.00	2.88	-44.1
Scenario 3		3.84	3.71		3.26	2.95	2.88	-44.5
Scenario 4		3.99	3.92		3.59	3.15	3.17	-40.4
Scenario 5		4.01	3.94		3.78	3.11	3.18	-39.3
Tanzania								
Observed	6.70	6.65	6.46	5.97	5.70	5.56	5.23	-58.8
Scenario 1	7.33	7.04	7.07	6.49	6.21	6.08	5.50	-55.8
Scenario 2	6.52	6.59	6.34	5.85	5.68	5.59	5.21	-53.4
Scenario 3		6.58	6.43	5.94	5.60	5.47	5.12	-61.2
Scenario 4		6.95	6.48	6.02	5.80	5.66	5.47	-65.2
Scenario 5		6.88	6.46	5.99	5.70	5.58	5.36	-67.5
Togo								
Observed	6.60	6.28	5.98		5.33	4.95		-66.3
Scenario 1	7.03	6.57	6.33		5.50	5.21		-71.1
Scenario 2	6.17	6.05	5.56		5.28	4.71		-59.1
Scenario 3		6.29	5.94		5.29	4.84		-70.9
Scenario 4		6.64	5.88		5.81	4.90		-70.7
Scenario 5		6.65	5.84		5.78	4.80		-75.2
Uganda								
Observed	7.32	7.05	7.00	7.00	6.91	6.74	6.43	-14.4
Scenario 1	8.05	7.63	7.80	7.61	7.41	7.27	6.77	-22.1
Scenario 2	7.39	7.12	6.99	6.95	6.82	6.53	6.16	-26.8
Scenario 3		7.04	7.01	7.03	6.83	6.61	6.16	-20.7
Scenario 4		7.11	6.91	7.00	6.90	6.77	6.30	-13.5
Scenario 5		7.10	6.91	7.03	6.82	6.65	6.04	-19.8
Zambia								
Observed	7.53	6.98	6.82	6.40	6.21	6.03	5.54	-50.5
Scenario 1	8.20	7.86	7.68	7.09	6.89	6.58	5.94	-67.0
Scenario 2	7.44	7.05	6.83	6.28	6.16	5.75	5.39	-65.4
Scenario 3		7.01	6.80	6.28	6.06	6.01	5.47	-54.7
Scenario 4		7.03	6.80	6.22	6.10	5.65	5.36	-69.0
Scenario 5		7.06	6.78	6.10	5.96	5.64	5.28	-73.2
Zimbabwe								
Observed	6.34	6.04	5.53	4.97	4.31	4.05	4.07	-103.9
Scenario 1	6.85	6.36	5.92	5.29	4.52	4.24	4.59	-112.9
Scenario 2	6.30	6.03	5.54	4.94	4.17	3.85	4.06	-114.7
Scenario 3		6.02	5.54	5.11	4.44	4.09	4.24	-99.5
Scenario 4		6.33	5.67	5.30	4.74	4.36	3.84	-97.2
Scenario 5		6.31	5.68	5.44	4.87	4.40	4.01	-92.7

Notes

1. The pace of fertility decline is measured as the change in Complete Family Size per 1000 women for a unit increase in birth year. It is estimated by fitting the slope to fertility estimates corresponding to 1950-54 through 1970-74 birth cohorts. To estimate this slope, I assume that the fertility estimates correspond to the middle year of each birth cohort – i.e., for example, fertility estimates for the 1950-54 cohort correspond to women born in 1952.5.
2. Scenario 1. No union dissolution
3. Scenario 2: No repartnering following union dissolution
4. Scenario 3: Union dissolution and repartnering rates remained the same as those of women born 1940-49 (1950-54 for Chad, Ethiopia, Gabon, Guinea and Niger)
5. Scenario 4: The effect of union dissolution and repartnering on fertility remained the same as those of women born 1940-49 (1950-54 for Chad, Ethiopia, Gabon, Guinea and Niger)
6. Scenario 5: Both scenarios 3 and 4 prevailed

Table A6 Sensitivity analysis of the influence of marital dissolution and repartnering on the pace of fertility decline in sub-Saharan Africa

Model and Scenario	Fertility (Mean Children Ever Born by age 40)							Pace of fertility decline	
	1940-49	1950-54	1955-59	1960-64	1965-69	1970-74	1975-79	Pace	Relative Ratio (Expected/ Observed
Model A (1)									
Observed			6.34	6.10	5.86	5.64	5.31	-52.3	
Scenario 1			6.65	6.47	6.20	5.90	5.52	-62.8	1.20
Scenario 2			6.31	6.02	5.76	5.44	5.13	-59.4	1.14
Scenario 3				6.11	5.85	5.57	5.22	-59.0	1.13
Scenario 4				6.01	5.75	5.48	5.15	-56.4	1.08
Scenario 5				6.01	5.73	5.41	5.07	-63.1	1.21
Model A (2)									
Observed			6.43	6.22	5.98	5.75	5.42	-52.6	
Scenario 1			6.72	6.57	6.32	6.03	5.67	-60.1	1.14
Scenario 2			6.37	6.14	5.88	5.59	5.28	-57.7	1.10
Scenario 3				6.23	5.97	5.70	5.33	-59.1	1.12
Scenario 4				6.13	5.85	5.59	5.24	-58.4	1.11
Scenario 5				6.13	5.84	5.53	5.16	-64.9	1.24
Model A (3)									
Observed			6.34	6.10	5.86	5.64	5.31	-52.3	
Scenario 1			6.67	6.49	6.23	5.94	5.55	-62.8	1.20
Scenario 2			6.29	6.00	5.74	5.43	5.13	-58.5	1.12
Scenario 3				6.11	5.85	5.56	5.21	-59.7	1.14
Scenario 4				5.99	5.73	5.45	5.14	-56.8	1.09
Scenario 5				6.00	5.72	5.37	5.04	-64.2	1.23
Model B									
Observed	6.95	6.65	6.44	6.21	5.93	5.71	5.41	-49.6	
Scenario 1	7.33	7.05	6.83	6.58	6.24	5.98	5.63	-57.0	1.15
Scenario 2	6.84	6.63	6.40	6.11	5.81	5.58	5.29	-54.2	1.09
Scenario 3		6.66	6.45	6.21	5.91	5.66	5.34	-53.1	1.07
Scenario 4		6.71	6.48	6.16	5.86	5.60	5.32	-56.7	1.14
Scenario 5		6.73	6.48	6.17	5.85	5.54	5.25	-60.1	1.21

Notes:

1. **Model A (1):** Accounting for HIV
   - *Analytical sample*: Women aged 40-49 for whom HIV status data is available (Countries = 25, Surveys = 54, N = 53,596).
   - *Specification (Controls):* Education, Area of residence, Age at first marriage, HIV status
2. **Model A (2):** Accounting for HIV and primary infertility (proxy)
   - *Analytical sample*: Women aged 40-49 who had at least one child by age 40 for whom HIV status data is available (Countries = 25, Surveys = 54, N = 52,480).
   - *Specification (Controls):* Education, Area of residence, Age at first marriage, HIV status, and Age at first birth
3. **Model A (3**): Like Model A (1), but does not control for HIV. It is an equivalent of the main Models in the main text but specified based on a reduced sample (Countries = 25, Surveys = 54, N = 53,596).
4. **Model B**: Accounting for primary infertility (proxy)
   - *Analytical sample*: Women aged 40-49 who had at least one child by age 40 (Countries = 34, Surveys = 143, N = 233,458).
   - *Specification (Controls):* Education, Area of residence, Age at first marriage, and Age at first birth
5. Scenarios are defined as in Table A5. The base cohort for Models A (1), A (2) and A (3) is 1955-59.
6. The pace of fertility decline is defined as in Table A5. Slopes are estimated across all cohorts for which counterfactual estimates are available (to ensure at least four data points are used for Models A (1), A (2) and A (3))

FIGURE A1 Comparison of observed fertility and expected fertility under different counterfactual union dissolution and repartnering conditions, according to birth cohorts