Educational Assortative Mating, Development, and Inequality in sub-Saharan Africa

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Abstract

Sub-Saharan Africa (SSA) is undergoing rapid transformations in the realm of union formation in tandem with significant educational expansion and rising labor force participation rates. Concurrently, the region remains the least developed and most unequal along multiple dimensions. In spite of this unique scenario, never has the stratification literature examined patterns and implications of educational assortative mating for inequality in SSA. Using 126 Demographic and Health Surveys from 39 countries between 1986 and 2016, this paper is the first to document changing patterns of educational assortative mating by marriage cohort, sub-region, and household location of residence, and relate them to prevailing sociological theories on mating and development. Results show that, net of shifts in educational distributions, mating has increased over marriage cohort in all sub-regions except for Southern Africa, with increases driven mostly by rural areas. Trends in rural areas align with the *status attainment hypothesis*, while trends in urban areas are consistent with the *inverted U-curve framework*. The inequality analysis conducted through a combination of variance decomposition and counterfactual approaches reveals that mating accounts for a non-negligible share (3-to-12 percent) of the cohort-specific inequality in household wealth, yet changes in mating over time hardly move time-trends in wealth inequality.

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INTRODUCTION

Over the past decades, there has been growing interest in patterns of educational assortative mating around the world. Assortative mating is a powerful driver of societal change, as it shapes the way people organize within families, affecting in turn individuals' access to resources and their distribution across families (Schwartz 2013). Patterns of mating with regard to couples' socio-economic characteristics are vital to understanding a whole set of dynamics in the demographic make-up of households, such as family formation, composition, and dissolution (Schwartz and Han 2014). They also have consequences for outcomes that are directly or indirectly linked to the family, such as longevity, health, fertility preferences, fertility behavior, etc. (Huber and Fieder 2011; Trimarchi, Schnor, and Van Bavel *forthcoming*). A proper understanding of mating patterns ultimately permits to shed light on fundamental changes underlying the demography of the population and the characteristics of the social stratification system. This paper focuses on trends, variation, and implications of educational assortative mating for inequality in sub-Saharan Africa (SSA), a region of the world that has experienced rapid socio-economic and demographic change over the past half century yet has been largely neglected in the assortative mating literature.

The study has three aims. First, using 126 Demographic and Health Surveys (DHS) collected between 1986 and 2016, I provide an overview of educational assortative mating patterns across 39 countries in SSA. Despite a series of global and comparative studies documenting declining *hypergamy*[1] around the world (Esteve *et al.* 2016; Esteve, García-Román, and Permanyer 2012), never has the assortative mating literature focused exclusively and comparatively on patterns of change within SSA.[2] Evidence is lacking on questions as simple as whether educational assortative mating has increased or decreased overtime. A more comprehensive study of mating in SSA is critical for several reasons. First and foremost, SSA countries are undergoing swift transformations in the realm of union formation, such as delays in mean ages at first union

(Bongaarts, Mensch, and Blanc 2017; Juárez and Gayet 2014; Shapiro and Gebreselassie 2014), along with increasing educational attainment particularly for women, and expanding female labor force participation rates (Grant 2015; Lopus and Frye 2018; National Research Council and Institute of Medicine 2005). Underlying these changes has been a massive growth in urbanization, spreading "modern" ideals stressing the value of education, encouraging later marriage, and reducing the influence of kin controlling the timing of marriage and choice of spouse (Cherlin 2012; Singh and Samara 1996). As these factors are important drivers of mating, there is reason to believe that changes in educational assortative mating might have occurred in SSA over the past half century. Yet, demographic change and urbanization have followed uneven trajectories within SSA, partly as a function of the various cultural specificities, diversified economies, political systems, but also crises – such as conflicts, civil wars, food shortages, and the HIV/AIDS epidemic – that countries or entire sub-regions have experienced (Cherlin 2012; Tabutin and Schoumaker 2004). Hence, a closer look at within-region dynamics is likely to deliver a more nuanced picture of the phenomenon, highlighting sub-regional heterogeneity and diverging patterns of change that are masked in "global" studies of mating.

Nevertheless, alongside the dramatic changes outlined above, there is evidence that SSA countries still lag behind other low- and middle-income countries (LMICs) in areas such as gender and couple-related dynamics. For instance, gender gap reversals in education are occurring more slowly in SSA than in other world regions (Esteve *et al.* 2016; Psaki, McCarthy, and Mensch 2018), as the gender gap in education has narrowed but not reversed yet. Similarly, previous research has found stark gender imbalances in intra-household bargaining dynamics (Ashraf, Field, and Lee 2014; Behrman 2018), to the extent that SSA remains the only region where the share of households in which the husband is the sole decision-maker reaches up to 40 percent (Pesando and the GFC team *forthcoming*). Accordingly, there is ground to hypothesize that trends towards increasing assortative mating documented globally, typically unfolding along with reversals in gender gaps in education and increases in women's empowerment (Esteve *et al.* 2012; Grow and Van Bavel 2015; De Hauw, Grow, and Van Bavel 2017; Schwartz and Han 2014), might be playing out differently in SSA.

One challenge in studies of mating is to determine whether increases in educational homogamy arise due to secular changes in educational attainment of women versus men, or because of shifts in mating itself. For instance, the narrowing of the gender gap in education may increase the chance that someone with secondary education is married to someone else with secondary education even in the absence of changes in the assortativeness of marriage (Liu and Lu 2006). As a second contribution of this study, I therefore compare *observed* patterns of mating to those predicted under *random* mating and investigate the extent to which trends in educational assortative mating are driven by compositional – i.e., changes in educational distributions – versus residual changes up and beyond changes in educational distributions. In other words, I explore the extent to which shifts towards homogamy can be accounted for by "mechanical" changes that result from proportionally faster increases in women's education, as compared to responses related to the shifting value of education and spouses' actual preferences for educational resemblance. To address this question, I conduct analyses by marriage cohort, sub-region of SSA, and household location of residence, and make use of contingency tables, marital sorting parameters, and log-linear models.

As a third contribution, I rely on the aforementioned accounting-based methodology (*observed* versus *random* mating) combined with a novel variance decomposition approach to assess implications of educational assortative mating for household wealth inequality. I measure wealth through the International Wealth Index (IWI) – the first comparable asset-based wealth index covering the complete developing world (Smits and Steendijk 2015) – and define household wealth inequality as inequality in asset possession between households.[3] I address the following counterfactual questions: what would happen to the wealth distribution if in every marriage cohort mating was random instead of assortative? Similarly, what would happen to wealth inequality if couples from the latest marriage cohort matched as those in the previous ones? These analyses address the broader puzzle of whether marital sorting on education affects household wealth inequality, another yet unexplored question in the SSA context, and rarely addressed in the assortative mating literature in general. More broadly, a more comprehensive understanding of determinants, trends, and implications of educational assortative mating in SSA has the potential to shed better light on the reciprocal linkages between demographic change, family change, and the social stratification system in a rapidly changing setting which has to date received little scholarly attention.

I find that educational assortative mating in SSA has followed different trajectories by sub-region and location of residence. Specifically, mating has increased across marriage cohorts in Western, Central, and Eastern Africa, yet it has flattened out and decreased in Southern Africa. Increases in mating have been largely driven by rural areas, where the trend for SSA as a whole is consistent with the *status attainment hypothesis*, while mating in urban areas has shown a mild increase followed by an incipient decline, consistent with the *inverted U-curve framework* and the increasing applicability of the *general openness hypothesis*. Lastly, the inequality analysis reveals that mating accounts for at most 12 percent of the cohort-specific inequality in household wealth, yet changes in mating over time hardly move time-trends in wealth inequality.

BACKGROUND

The Sub-Saharan African Context: Educational Expansion, Urbanization, and Family Change

Over the last few decades, there has been an increase in mean grades of schooling attained among young women in all regions of the developing world (Mensch, Singh, and Casterline 2006; Psaki *et al.* 2018). Yet in their recent global study of declining educational hypergamy, Esteve *et al.* (2016) claim that African countries have the lowest proportions of the population with college education and the lowest levels of women's education compared to men's. According to their study, time trends indicate little progress in expanding college education in Africa, but substantial progress in women's education that has contributed to narrowing gender gaps, which still favor men. A key factor underlying the expansion of education has been the massive growth in the share of the population living in cities, which started from very different levels across sub-regions, as Southern Africa was already far more urbanized than the other sub-regions in the 1950s. Heterogeneity in the degree of urbanization between sub-regions has lessened since the 1950s, as the least urbanized regions 50 years ago (Eastern Africa, followed by Western and Central Africa) have experienced the highest urban growth, with the urban population multiplied by roughly 20 between 1950 and 2000 (Tabutin and Schoumaker 2004).

In tandem with these macro-structural transformations, African families have changed in domains that are likely to relate to mating patterns. First and foremost, age at marriage has risen throughout the continent (Koski, Clark, and Nandi 2017; Tabutin and Schoumaker 2004). According to data from the United Nations (UN) Department of Economic and Social Affairs Population Division (2015), the singulate mean age at marriage is now greater than 18 in the majority of countries in the region. This is relevant, as the age at which men and women form unions is influenced by social norms and expectations regarding their roles as spouse and parent – factors that are likely to change with globalization, urbanization, and rising educational attainment. Mensch *et al.* (2006) found a marked reduction in the percent of 15-19-year-olds married throughout most LMICs over the past 30 years. These reductions were particularly striking in SSA.

Even so, SSA remains the region with the highest rates of child marriage in the world (Singh and Samara 1996), for the most part driven by Western and Central Africa.[4] Western and Central Africa are also the regions with the highest percentage of women ever married by age 25, while in Eastern and Southern Africa the likelihood of being still unmarried at 25 is higher (Mensch *et al.* 2006).[5] Southern Africa has had a late marriage pattern since the early 1970s, and is now the only sub-region in SSA to exhibit non-negligible shares of never-married individuals (about 15 percent of women at age 45), partly due to labor migration (Tabutin and Schoumaker 2004).

Western Africa is also distinctive in that in most countries age at marriage has been increasing for women but not for men, likely due to changes in the practice of polygyny – an idiosyncratic feature of the region. Research suggests that in SSA the expansion of schooling has had some impact on delaying women's age at marriage, yet a considerable fraction of the increase cannot be accounted for by changes in education. Conversely, rising costs of establishing a household have been found to contribute more than increasing educational attainment to men's marriage delays (Mensch *et al.* 2006).

Differential increases in men and women's ages at first union affect inter-spouse age differences, whose variation across societies can be interpreted in terms of two interrelated factors, namely kinship structure and women's status. Casterline, Williams, and McDonald (1986) suggested that in patriarchal societies and in societies characterized by patrilineal kinship organization, the spousal age difference tends to be relatively large, and unions in which the husband is ten or more years older are relatively frequent. Conversely, in settings where the traditional social structure allows for a more equal status of spouses, or where exposure to Western family forms and modernization processes have improved the status of women – such as Southern Africa – the age difference tends to be smaller. Indeed, variation in inter-spouse age differences is also explained by marriage market – namely, age-structure – constraints. On the whole, research from SSA suggests that age differences at first marriage have narrowed, though they remain important in a subset of Western African countries such as Guinea-Bissau and Sierra Leone (Tabutin and Schoumaker 2004).

Theoretical Perspectives on Educational Assortative Mating, Development, and Inequality.

A focus on temporal and spatial variation in the association between spouses' educational attainment originated from studies on high-income Western societies around the 1960s, very much driven by the ideas that industrialization brings progress and differences in countries' level of socio-economic development may explain variation in homogamy. The underlying logic – embedded in theoretical perspectives such as *modernization* theory (Blau and Duncan 1967; Parsons 1971), *industrialization* theory (Kerr 1983), and *individualization* theory (Beck 1986; Giddens 1991) – builds on the premise that industrialization and social modernization unfold in tandem with trends towards social openness and meritocratization, thus weakening societies' social structures and social boundaries.

Within this modernization macro-perspective, scholars have formulated and tested three competing hypotheses relating socio-economic development and educational homogamy both across countries and within countries overtime (Smits, Ultee, and Lammers 1998). First is the *general openness hypothesis*, which postulates that development leads to less educational homogamy because of the decrease in parents' control over the marriage process and the increase in the number of contacts between individuals from different classes and status groups, occurring through greater geographical mobility, more education, and the spread of mass communication (Blossfeld 2009; Smits *et al.* 1998). The second one, called the *status attainment hypothesis*, postulates instead a positive relationship between economic development and educational homogamy due to the increased importance of education as a marker of social status – which in turn pushes high-educated individuals to increasingly select their partners based on educational considerations (Blossfeld and Timm 2003; Kalmijn 1998; Treiman 1970). The third hypothesis – the *inverted U-curve hypothesis* – combines the previous two and predicts an increase in educational homogamy in the first phase of the industrialization process, where status considerations and parental authority still play an important role in partner choice. Conversely, the decrease in educational homogamy takes place in a second phase, where rising wages and more binding laws loosen the parental bond and give individuals more freedom to marry whom they like, hence following more closely the logic of 'romantic love.'[6]

It has also been widely recognized that the degree of partners' homogamy along specific socio-economic characteristics has the potential to shape different dimensions of inequality. Among these is household income inequality. Thinking about marital sorting on education – provided there is a reasonable correlation between educational attainment and later-life earnings – societies in which high-educated marry other high-educated and low-educated marry other low-educated will be more unequal than those in which high-educated marry low-educated. Increased educational assortative mating may affect inequality through changing the distribution of household configurations (or "types"), regardless of whether the increase itself is produced by shifts in shares of people with certain levels of education (so-called, *structure*), or changed sorting behavior (so-called, *preferences*). Given that household types possess different amounts of human capital – hence, different income potentials – a changed distribution of household types is expected to change inequality between types (Breen and Andersen 2012).[7]

Review of Evidence

Studies evaluating the applicability of the aforementioned hypotheses relating mating and development has delivered quite mixed – and conflicting – findings. Evidence in favor of a trend towards more educational homogamy has been found for several highly developed Western societies – mostly the United States (US) and some European countries – by scholars as diverse as Blossfeld and Timm (2003), Kalmijn (1991), Mare (1991), Qian and Preston (1993), Schwartz and Mare (2005), and Smits *et al.* (2000). Gradually, research examining trends and variation in educational assortative mating has expanded to other societies across Latin America (Esteve and McCaa 2007; Esteve, López, and McCaa 2013; Ganguli, Hausmann, and Viarengo 2014; Gullickson and Torche 2014; Torche 2010), East Asia (Hu and Qian 2015; Park and Smits 2005; Smits and Park 2009), South Asia (Borkotoky and Gupta 2016; Prakash and Singh 2014), adopting a more large-scale comparative approach (Esteve *et al.* 2016; Esteve *et al.* 2012; Raymo and Xie 2000; Smits 2003; Smits *et al.* 1998, 2000; etc.).

Research including LMICs suggests a more complex picture. Using data from 65 countries, Smits *et al*. (1998) found a cross-sectional inverted U-shaped relationship between level of development and educational homogamy. The status attainment hypothesis (higher development, higher homogamy) was supported only when comparing the least-developed countries with countries at intermediate levels of development, while the general openness hypothesis (higher development, lower homogamy) was supported when comparing countries at intermediate levels with the most developed ones. Consistent with this finding, in a follow-up study covering 55 countries, Smits (2003) found declining educational homogamy and more openness in more rapidly developing countries. Although evidence from long-term trend studies remains scarce, less educational homogamy in more developed countries – mostly Asian – has also been confirmed in trend studies such as Raymo and Xie (2000), Smits *et al.* (2000), and Smits and Park (2009) and attributed to modernization patterns, higher female labor force participation rates, and less Confucian influence.

While examining trends and variation in educational assortative mating has taken a rather global and comparative scale (except for SSA), studies assessing implications of mating for inequality have centered primarily on high-income societies. Hu and Qian (2015) and Torche (2010) are notable exceptions from China and Latin America (Brazil, Chile, and Mexico), respectively. From this body of studies there is overwhelming agreement that educational assortative mating plays a small to negligible role in explaining trends in household income inequality. In the US context, Western, Bloome, and Percheski (2008) found that neither educational inequalities in women's incomes nor assortative mating contributed significantly to the rise in inequality. Similar results for the US are echoed in Breen and Salazar (2011), Eika, Mogstad, and Zafar (2017), and Greenwood *et al.* (2014). Similar conclusions were reached in the European context by Breen and Salazar (2010) for the UK and Boertien and Permanyer (2017) for a subset of 21 European countries. A minor exception to this finding is Breen and Andersen (2012), who showed that in Denmark – where inequality increased between 1987 and 2006 but educational homogamy declined – changes in assortative mating increased income inequality by about 7 percent, almost fully driven by changes in the educational distribution of men and women rather than in the propensity to choose a partner with a given level of education.

Several hypotheses have been proposed to shed light on the weak relationship between educational assortative mating and income inequality (Schwartz 2013). One postulates that increases in educational homogamy may not be large enough to produce meaningful shifts in inequality (Breen and Salazar 2011). Yet Boertien and Permanyer (2017) showed that even under extreme counterfactual scenarios, results would not change. Another hypothesis is that increases in educational homogamy among some types of couples might be offset by declines among other types of couples, such that the overall effect on inequality is negligible (Rosenfeld 2008). Alternatively, wives' education might not be as highly correlated with earnings as one would think.

This very much depends on post-sorting labor supply adjustments, but if most women exit the labor force upon union formation, the correlation between the two would be driven down. In light of the latter hypothesis, some of the most recent literature has claimed that women's relative position within the couple and their labor supply decisions might constitute the "missing link" in explaining increases in family income inequality (Gonalons-Pons and Schwartz 2017).

Contribution and hypotheses

Although comparative studies such as Smits *et al.* (1998; 2000) included a few SSA countries, the relationship between mating and development – and the associated hypotheses – have never been wholly evaluated in the African context. This study attempts to do so by adopting a time-trend perspective. It is challenging to generalize claims on patterns of educational assortative mating in a region of the world as diverse and heterogeneous as SSA, yet documenting trends by sub-region and location of residence (urban/rural) is a first step towards a better understanding. As – comparatively – SSA countries rank lowest on development indices such as the Human Development Index (HDI), the above theories would suggest an *increase* in educational assortative mating over time in line with the status attainment hypothesis, with considerable differences by sub-region of SSA and location of residence, consistent with different rates of modernization and urbanization.

I hypothesize a more marked increase in mating in rural areas paralleled by a less marked increase (or incipient decline) in urban areas, where the general openness hypothesis is more likely to take hold – as driven by greater geographical mobility, educational expansion, cross-cultural exchange, and mass communication. Also, the widespread geographical heterogeneity in trajectories of development and socio-cultural practices – such as child marriage, arranged marriage, polygyny, patriarchy, and patrilocality – and their differential prevalence (more prevalent in Western and Central Africa, less so in Eastern and Southern) and decline over time leads to expect heterogeneous patterns of mating by sub-region of SSA, with Western Africa and Southern Africa following the most diverse – likely, opposed – trajectories.

Previous scholarship also provides no assessment of the implications of changing mating patterns for inequality in SSA. The main challenge in this context – as in many other LMICs – is the lack of good measures of household income or, even more so, the lack of measures of each partner's earnings. However, most existing surveys such as the DHS collect information of household assets that enter the computation of a wealth index which is measured at the household level. Previous research has shown that in contexts where household income or consumption is absent, wealth indices are effective indicators of long-term socio-economic position, living standards, or material well-being of households (Filmer and Pritchett 1999, 2001; McKenzie 2005; Sahn and Stifel 2000). Shimeles and Ncube (2015) have shown that this is also the case in Africa. My analysis investigates whether educational assortative mating has implications for inequality defined as inequality between households in asset possession. Although not ideal and perhaps far from measuring an equivalent of partners' income, an approach of this kind has the potential to shed some light on the relationship between mating and inequality, thus providing some foundations for a better understanding of the social stratification system in the African context.

DATA AND MEASURES

The analysis uses pooled cross-sectional Demographic and Health Survey (DHS) data – 126 survey waves – from 39 sub-Saharan African countries (on average four waves per country). DHS are publicly available nationally representative surveys of women ages 15-49 collected by ICF International in collaboration with host country governments. Standardized questionnaires allow for comparisons across countries and survey waves. SSA countries are grouped in four regions –

namely Western (14 countries), Central (8 countries), Eastern (12 countries), and Southern Africa (5 countries) – according to the classification provided by the United Nations Statistics Division (UNSD) – see Table 1. The pooled comparative analysis offers a series of advantages over country-specific studies, including more observations, more variance on key variables, and the ability to assess pan-national regional trends (for similar analyses using DHS data, see Clark and Brauner-Otto 2015; DeRose and Kravdal 2007; Reniers and Tfaily 2012; Smith-Greenaway and Trinitapoli 2014, etc.). The analysis spans a 30-year time frame, with the oldest surveys collected in 1986 in Liberia and Senegal, and the most recent survey collected in 2016 in Ethiopia. Additional details on the countries included, the number of waves, and the number of observations (couples) per wave are provided in Appendix Table A1.

[Insert Table 1 about here]

In line with the observation that the focus on marriage cohort – rather than survey year or birth cohort – is more adequate for detecting trends in educational homogamy (Mare 1991), in this study I assess time trends over marriage cohort (MC). A similar perspective has been adopted in several prominent studies in the field (Casterline *et al.* 1986; Smits and Park 2009; etc.). I construct ten 5-year marriage cohorts: <1970, 1970-1974, 1975-1979, 1980-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004, 2005-2009, >=2010.[8] This approach is sensible when using DHS data as surveys are collected at non-regular intervals, hence only data from selected countries are available for each survey year.

While DHS collect couple-level files in some countries, this study relies on information provided in the women's file to maximize the number of couples in the analysis.[9] I use the partnership information provided by the women to construct a couple-level dataset where wives and husbands are nested within couples.[10] Women whose marital status is missing or who provide no information on their own and/or their partner's educational attainment are excluded from the sample. I keep couples who are currently married or living in a cohabiting union ("living together"), and rely on the DHS definition of marital union, which includes both civil and customary marriages – as prevalent in the African context (van de Walle and Meekers 1994). In so doing, I follow previous scholarship in the claim that in settings where the definition of union is ambiguous and the process of union formation is "fluid," distinguishing between formal marriages and informal unions may be impossible, hence the combination of the two constitutes the correct focus (Casterline *et al*. 1986; Clark and Brauner-Otto 2015; Gage 1995).

The sample is further restricted to couples where women are between the ages of 25 and 40. The reason is that by age 25 virtually all women have reached their highest educational level, and 95 percent of them have entered their first union, therefore reducing concerns about censoring on single marital status or education (Esteve *et al.* 2012). To avoid specification problems, I perform sensitivity analyses using both narrower and wider age ranges (15-49, 20-35, 30-45); results obtained are essentially the same and reported in the Appendix. As the DHS only provide data on the year of first union and include information on the education of the current partner/husband – but not any previous one – the sample is limited to couples where women have been married or have cohabited only once, i.e. about 82 percent of women (in a spirit similar to Casterline *et al.* 1986).[11] These restrictions provide a sample of 416,038 couples with complete information on marital status, year of first union, and educational level of both partners.

The DHS include a categorical and a continuous measure of educational attainment, namely highest level attained, and grade attained. The categorical variable is coded as follows: 0 for "no education", 1 for "primary", 2 for "secondary", and 3 for "higher." The continuous variable ranges from a minimum of 0 to a maximum of 23. While the continuous variable offers a more precise measure of schooling achievement, it ignores the importance of academic boundaries, which matter more for determining whether individuals marry "within their group." Furthermore, this latter classification captures arguably similar stages in the educational career, even if these stages represent a different number of years across countries. Table 2 provides descriptive statistics on the number of couples and the highest level (panel a) and grade (panel b) attained by wives and husbands, by marriage cohort. Estimates suggest that couples from the earliest marriage cohort (<1970) have on average some lower primary schooling, with husbands completing 2.7 grades, as compared to wives completing around 1.4 grades. Conversely, couples from the latest marriage cohort (>2010) possess upper primary/secondary education, with wives and husbands attaining an average of 8.3 and 9 school grades, respectively. Overall, the table shows a steep increase in educational attainment over marriage cohort, with a proportionally faster increase – yet no gender gap reversal – in wives' educational attainment, hinting at decreasing intra-household schooling inequality over time. Most importantly, a comparison between the two panels suggests a high degree of consistency between the categorical and the continuous measures – hence I can more confidently rely on the former in all analyses that follow. For instance, wives' averages in the 1970-1974 marriage cohort are 1.2 and 1.3 times their <1970 value for the categorical and continuous measures, respectively, while husbands' averages are 1.1 times their <1970 value for both measures. Similarly, wives' averages in the latest marriage cohort are 5.1 and 5.8 times their <1970 value for the categorical and continuous measures, respectively, while husbands' averages are 3.2 and 3.3 times their <1970 value. Appendix Table A2 provides descriptive statistics on spousal differences in age by marriage cohort and shows similar patterns. While in the earliest marriage cohort the average difference is 11 years, in the latest it is reduced by about half.[12]

[Insert Table 2 about here]

To measure household wealth, I rely on the International Wealth Index (IWI), the first comparable asset-based wealth index measuring the level of material well-being and standard of living in the complete developing world (Smits and Steendijk 2015). IWI is a stable and understandable yardstick for comparing the performance of societies with regard to wealth, inequality and poverty. IWI runs from 0 to 100, with 0 representing households having none of the assets and lowest quality housing, and 100 representing households having all assets and highest quality housing. Information collected on the possession of consumer durables, access to basic services and housing characteristics is entered into a factor analysis (PCA) from which the first factor is selected as the wealth index.[13]

Thanks to the inclusion of a household identifier, the IWI can be merged to the original DHS datasets. Note, however, that the IWI cannot be computed for some DHS surveys collected before (or around) 1990. It follows that the analytical sample included in the wealth analysis is reduced from 416,038 to 392,486 couples (~94 percent of the original sample), for a total of 112 survey waves across 38 countries – rather than 126 across 39 countries.[14] The main benefit of the IWI over the standard wealth index provided in the DHS lies in its comparability across countries and over time. As a matter of fact, the standard DHS wealth index is specific to the situation in each country at the time of the survey, making it a reliable measure only for households within a certain country-year combination. This is not to claim that the IWI provides a flawless measure of assets and wealth – its limitations will be discussed in the concluding remarks – yet it is more suited to studies that are comparative in nature.

TRENDS IN COUPLES' EDUCATIONAL COMPOSITION

Figure 1 describes the types of unions prevailing in SSA in the earliest (left panel) and latest (right panel) marriage cohorts available for each country.[15] The graph reports the share of homogamous ("="), hypergamous ("H"), and hypogamous ("W") unions for the 39 countries. The dominant pattern across cohorts is one in which the highest share of couples is homogamous followed, respectively, by hypergamous and hypogamous unions. Some exceptions are noteworthy. First, looking at the left panel we observe that the share of hypergamous couples is higher than – or very close to – the share of homogamous couples in countries such as Angola (AGO), Gabon (GAB), Mozambique (MOZ), Sao Tome and Principe (STP), and Uganda (UGA) – yet there is a trend towards declining hypergamy across cohorts observed in all five countries. Second, hypogamous unions are more prevalent than hypergamous unions in Botswana (BWA), Lesotho (LSO), Namibia (NAM), and Swaziland (SWZ), highlighting the somewhat peculiar nature of Southern African countries, and providing a first indication that assortative mating dynamics might differ by sub-region. In terms of extreme cases, Lesotho and Liberia stand out for being the countries with the highest shares of hypogamous and hypergamous unions, respectively.

[Insert Figure 1 about here]

The two panels combined suggest significant changes in the composition of couples between the earliest and latest marriage cohort, evidencing a far narrower distribution in the right panel, driven primarily by a combination of increasing hypogamy and declining hypergamy. The coexistence of these opposing dynamics (namely, W moving the right and H moving to the left) alters the prevalence of homogamy only to a small extent. In fact, as shown in Appendix Figure A1 (top panel), country and sub-regional trends in the share of homogamous couples are heterogeneous – declining across Western and Central Africa and mildly increasing across Eastern and Southern regions – and point towards a modest decline for SSA as a whole from 0.7 to around 0.6. Hidden from these figures is, however, an assessment of the extent to which the composition of homogamous couples has changed over time, i.e., whether variation along the educational distribution is responsible for observed upward or downward trends in educational homogamy.

Figure 2 plots the share of unions involving men and women of the same educational strata by educational level, for SSA as a whole (top panel) and by location of residence (bottom panel). The top panel points towards declining shares of homogamous couples with no education and increasing shares of homogamous couples with secondary or higher education. As the share of couples with both partners having primary education has remained virtually unchanged, this graph suggests that homogamy trends in SSA have been mostly driven by changes at the bottom and the top of the educational distribution. Specifically, the share of couples with both spouses having no education has declined from about 0.5 to 0.1, while the share of couples with both spouses having secondary or higher education has increased from 0 to 0.22 and 0.14, respectively. The steep decline in couples with no education (also shown in Figure A1, middle panel, by country and sub-region) thus more than offsets the weaker increase in couples with higher education (also shown in Figure A1, bottom panel, by country and sub-region), producing a downward overall trend in the share of homogamous couples – all levels of education combined.

[Insert Figure 2 about here]

Estimates by location of residence (Figure 2, bottom panel) show vastly different trends between urban and rural areas. While most of the decline in the share of homogamous couples with partners having no education is occurring in rural areas, increasing shares of couples with partners having secondary or higher education are driven primarily by urban areas. This is reasonable, as these areas underwent rapid industrialization earlier in time, thereby creating economic growth and job opportunities drawing people to cities, in tandem with a faster expansion of higher education and access to other public services.

Although the share of homogamous unions is a straightforward measure of educational homogamy (Mare 1991), trends in educational assortative mating based on this variable should be interpreted with caution (Schwartz and Mare 2005; Torche 2010). The reason is that – thinking about a simple cross-tabulation of wife and husband's education – variation in observed proportions in different categories of the joint distribution of partners' education is the outcome of two "forces": variation in the marginal distributions (e.g., declines in the share of women with no education over time), and variation in the association between partners' educational attainment net of marginal distributions (Torche 2010). For instance, the share of homogamous unions may simply be higher in the earliest marriage cohort because of the high concentration of husbands and wives in the "No education" category. Even given a constant association between husbands' and wives' levels of education, periods in which the marginal distributions are highly concentrated tend to produce a higher percentage of homogamous unions (Schwartz and Mare 2005). In what follows, I address this criticism and explore whether the strength of the association between husbands' and wives' education has increased, or whether this trend is altered after controlling for shifts in the marginal distributions of husbands' and wives' education.

POSITIVE EDUCATIONAL ASSORTATIVE MATING

Marital Sorting Parameters

To measure educational assortative mating I follow an approach similar to Eika *et al.* (2017) and Greenwood *et al.* (2014), based on contingency tables and marital sorting parameters. For every given marriage cohort, each cell in the contingency table gives the *observed* fraction of partnered households that occurs in a specific educational pairing. *Positive* (negative) educational assortative mating is defined as men and women with the same level of education marrying *more* (less) frequently than what would be expected under a marriage pattern that is *random* with respect to education. Marital sorting between education levels e_h and e_w is then the observed probability that a husband with education level e_h is married to a wife with education level e_w, relative to the probability under random mating with respect to education:

$$s(e_h, e_w) = \frac{Pr(E_h = e_h, E_w = e_w)}{Pr(E_h = e_h)\Pr(E_w = e_w)} \tag{1}$$

where E_h (E_w) denotes the education level of the husband (wife). Positive assortative mating occurs when the marital sorting parameter $s(e_{h,}e_w)$ is larger than 1 when i is equal to j. In a contingency table world, the diagonal of the contingency table describes the matches that occur when husbands and wives have the same educational level. This observed pattern of mating can be compared with the one that would obtain if husbands and wives matched randomly.[16] Taking the sum along the diagonals for each of these two types of matches, actual and random, and computing the ratio of these two sums, we obtain $s(e_{h,}e_w)$. The estimated marital sorting parameters – relative sum of diagonals – by marriage cohort are plotted in Figure 3 by sub-region (top panel) and location of residence (bottom panel). The exact values of the sorting parameters are provided in Appendix Table A4.

[Insert Figure 3 about here]

Figure 3 provides evidence of positive educational assortative mating in SSA. That is, the ratios are larger than one, implying that the number of matches between husbands and wives with identical education is larger than what would occur if matching was random. Sorting parameters are higher for the latest marriage cohort relative to the earliest one, both for SSA as a whole and for each sub-region individually (top panel), suggesting that educational assortative mating has increased over subsequent cohorts. However, while for the whole SSA the marital sorting parameter increases monotonically from 1.4 to approximately 2 – meaning that in the latest marriage cohort assortative matches occur twice as often relative to a situation in which matches are formed randomly – sub-regional trends are heterogeneous. Positive assortative mating in early cohorts is lower in Western Africa, yet this region experiences the steepest increase in the sorting parameter followed, in turn, by Eastern and Central Africa. Conversely, Southern Africa experiences mild increases across early cohorts, followed by a downward trend thereafter. Steep upward trends in Western Africa and relatively flat/downward trends in Southern Africa are confirmed in Appendix Figure A2, which tests the robustness of the findings to alternative age ranges of women. The Southern African trends that emerge from this analysis are unique within SSA, and consistent with the hypotheses outlined in the theoretical background.

The bottom panel of Figure 3 provides estimates of the marital sorting parameters by location of residence and shows evidence of positive educational assortative mating in both urban and rural areas. Although mating in early cohorts is higher in urban areas, most of the increase in mating across cohorts is accounted for by changes in rural areas, where the sorting parameter increases monotonically from 1.3 to about 2.1. Conversely, overall trends in urban areas are fairly flat. Note that Southern Africa is the only sub-region where the sorting parameter does not follow an upward trend neither in urban nor rural areas, and where the rural-urban divide in mating patterns is less stark. As such, these figures provide some indication of the applicability of the *status attainment hypothesis* in rural areas and the *inverted U-curve framework* in urban areas, where greater geographical mobility, educational expansion, cross-cultural exchange, and mass communication contribute to the gradual spreading the logic of 'romantic love.'

As previous literature suggests that conclusions about changes in mating are dependent on the methodology used (Blossfeld 2009; Rosenfeld 2008; Schwartz 2013; Schwartz and Mare 2005), in Appendix Figure A3 I present results using an alternative measure, namely Kendall's tau correlation between husband and wife's highest level attained in each 5-year marriage cohort.[17] Despite minor discrepancies, this supplementary analysis confirms my main findings, i.e., the steep increase in the tau-correlation in Western Africa, the uniqueness of Southern Africa as the only sub-region where mating has not increased, and the pivotal role of rural areas in driving SSA mating patterns.

Log-Linear Models

In line with prominent sociological literature on educational assortative mating (Mare 1991; Schwartz and Mare 2005; Smits *et al.* 1998; Torche 2010; etc.), I complement the above analysis with a series of log-linear models. The underlying motivation is to summarize international variation in marital sorting in the best – defined as a combination of fit and parsimony – possible way. Log-linear models are appropriate in that they provide estimates of the changing association between couples' educational characteristics while controlling for shifts in their marginal distributions (e.g., Agresti 2002). I estimate the following model (henceforth, baseline):

$$ln(F_{ijkl}) = \lambda + \lambda_i^H + \lambda_j^W + \lambda_k^R + \lambda_l^M + \lambda_{ij}^{HW} + \lambda_{ik}^{HR} + \lambda_{il}^{HM} + \lambda_{jk}^{WR} + \lambda_{jl}^{WM} + \lambda_{kl}^{RM} + \lambda_{ikl}^{HRM} + \lambda_{jkl}^{WRM} + \lambda_{ijk}^{HWR} \quad (2)$$

where *H* is husband's education (*i*=1,2,3,4), *W* is wife's education (*j*=1,2,3,4), *R* is sub-region (*k*=1,2,3,4), and *M* is marriage cohort (*l*=<1970, …,>=2010). In line with previous analyses, I estimate models separately for the overall sample, urban, and rural areas. F_{ijkl} is the expected number of unions between husbands in education category *i* and wives in education category *j*, in sub-region *k*, from marriage cohort *l*. This baseline model captures variation in the distribution of husband's and wife's education by cohort and sub-region (λ_{ikl}^{HRM} and λ_{jkl}^{WRM}), allows the interaction between husband's and wife's education to vary by sub-region (λ_{ijk}^{HWR}), and contains all lower-order terms. In a second step I add homogamy and crossing parameters to the baseline specification to assess which model fits the data best. A *homogamy* model is:

$$ln(F_{ijkl}) = Baseline\ model + \gamma_{ol}^{OM} \quad (3)$$

where *O*=1 if husband's education category equals wife's education category, and 0 otherwise. γ_{ol}^{OM} estimates the change in the odds of homogamy in marriage cohort *l* relative to the baseline year (<1970). A *crossing* model is:

$$ln(F_{ijkl}) = Baseline\ model + \gamma_{ijl}^{CM} \quad (4)$$

where $\gamma_{ijl}^{CM} = \begin{cases} \sum_{q=j}^{i-1} \gamma_{ql} \; for \; i > j \\ \sum_{q=i}^{j-1} \gamma_{ql} \; for \; i < j \\ 0 \; for \; i = j \end{cases}$

γ_{ql} represents the change in the difficulty of crossing educational barrier q in marriage cohort l relative to the baseline year. Crossing models summarize the association between spouses' education as a series of barriers to marriage between education groups, or in terms of the relative permeability of boundaries between adjacent education groups. Hence, the crossing parameters measure the log odds of marriage for couples in adjacent education categories relative to the log odds of homogamy, net of the marginal distributions of spouses' education (Schwartz and Mare 2005; Torche 2010).

Table 3 provides the model specifications and fit statistics of the log-linear models. The table is divided in three panels, for SSA as a whole (panel a), urban areas (panel b), and rural areas (panel c). I present both the deviance and the Bayesian Information Criterion (BIC) statistics for model fit, yet rely mainly on the latter due to large sample sizes that make it hardly possible to find a model that does not significantly differ from the saturated model (Raftery 1995). More negative BIC statistics indicate a better-fitting model, and differences in BIC values that are larger than 10 provide good evidence that the model with the more negative BIC fits the data better.

[Insert Table 3 about here]

Model 1 is the baseline model, which assumes that the educational resemblance of spouses is time invariant – yet it is allowed to vary by sub-region.[18] This model (panel a) fits the data better than alternative general specifications that also allow the association to vary by marital cohort (Model 2). Model 3 is the homogamy trend model, which parameterizes the trend as a change in the likelihood that husbands and wives share the same education level. By the BIC, adding this term does not alter the fit of the model relative to the baseline model, suggesting that the tendency for couples to marry within the same education category has not changed significantly in SSA over subsequent marriage cohorts. This model, however, might conceal variation in trends across different portions of the distribution (Schwartz and Mare 2005). Model 4 hence allows the degree of homogamy to differ across the diagonal cells of the homogamy table, showing a marginal improvement over the homogamy model described by a single parameter. Model 5 significantly improves the fit of the model by including an asymmetry parameter which accounts for the possibility that men and women "marry up" or "marry down" with respect to socioeconomic characteristics.[19] Model 6 is the crossing trend model, which adds terms to capture variation in the difficulty of crossing educational boundaries across the education distribution. The crossing model provides a better fit to the data than the baseline model, while it performs worse than the gender asymmetry specification. Models 7, 8, 9, and 10 are similar to 3, 4, 5, and 6, respectively, although the added parameters (O, D, A, and C) are allowed to vary by sub-region too, testing the assumption that variation over marriage cohort might unfold differently across contexts. Among these, Model 7 (OMR) significantly improves upon all previous specifications, indicating that while the tendency for couples to marry within the same education category for SSA as a whole has not changed significantly over marriage cohort (Model 3), the same is not true once sub-regional differences are accounted for.

Models 11 to 14 build on Model 7 by adding inter-cohort (Models 11 to 13) and cross-regional (Model 14) variation in diagonal, asymmetry, and crossing parameters. As Model 12 has the lowest BIC, I conclude that the best-fitting model is one that permits the homogamy parameter to vary by marriage cohort and sub-region (OMR), while allowing for an asymmetric tendency to marry up or down to vary by marriage cohort (AM). Consistent with my previous findings I show that model specifications summarizing variation in marital sorting differ between urban and rural areas, and that SSA trends are mostly driven by variation in rural areas. In line with panel a, in rural areas (panel c) Model 7 is the best fitting model, and Model 12 provides a similar level of fit.

Conversely, in urban areas (panel b), the baseline model is good enough to summarize variation in the data.

Overall, this analysis shows that trends in assortative mating in SSA are better described by inter-cohort and cross-regional variation in homogamy, rather than by changes in the degree to which couples cross educational barriers. In other words, variation in individuals' preferences for educational resemblance – or their opportunities for such marriages – summarizes trends in assortative marriage in SSA better than variation in the strength of barriers to intermarriage across educational boundaries. This finding is novel in itself and departs from previous scholarship in the US (Mare 1991; Schwartz and Mare 2005) and Latin America (Torche 2010) which shows crossing models to be better performing.

INEQUALITY IMPLICATIONS OF EDUCATIONAL ASSORTATIVE MATING

Trends in Wealth Dispersion

I begin the inequality analysis by exploring how between-household wealth inequality has evolved over marriage cohort. Note that for this part of the analysis the number of marriage cohorts is reduced from ten (5-year) to five (10-year) to maximize sample variability.[20] As the IWI is measured on a 0-100 scale in every country and it is comparable both between countries and over time, I measure inequality through the most straightforward measure of dispersion, i.e. the variance or standard deviation (SD). Specifically, I compute the variance of the IWI for every country-cohort combination.

Figure 4 provides a geographical overview of wealth dispersion (in SD) by country and marriage cohort. In a spirit similar to Figure 1, I provide estimates for the earliest (left panel) and latest (right panel) MC available for each country. The map shows that wealth dispersion is on average higher in Southern Africa and has increased across cohorts throughout most of SSA. There are some exceptions to this pattern in countries such as Gabon, Nigeria, and Central African Republic, where wealth dispersion shows a downward trend. Table A5 in the Appendix reports estimates from an OLS regression of the IWI SD on a categorical variable for MC. Estimates show that wealth dispersion has been increasing over MC, with only minor differences between urban and rural areas. Compared to the SD in the earliest cohort, the SD in IWI in the latest cohort for SSA as a whole is 6 to 7 units higher (panel a). Although there is a dearth of research on patterns of wealth inequality in SSA – mostly due to the complexities inherent in measuring social and economic performance in this region (Harttgen, Klasen, and Vollmer 2013; Klasen and Blades 2013) – my findings are consistent with figures from the African Development Bank (Shimeles and Nabassaga 2018).[21] Other recent studies suggest that inequality trends across countries in Africa have not leveled off, with no downward pattern emerging either with respect to the recent economic resurgence, or any other improvements in the level of human development (Bigsten 2018; Fosu 2015).

[Insert Figure 4 about here]

Counterfactual Analysis

To assess implications of educational assortative mating for household wealth inequality, I follow a simple – and, to the best of my knowledge, novel – approach that well suits micro-level data. Specifically, I model the cohort-specific variance (VAR) of wealth:

$$VAR[W]_l = \left[E(W^2)_l - \left(E(W)\right)^2{}_l\right] \quad (5)$$

and use regression analysis to estimate counterfactual expectations reweighting the betas using either *observed* (assortative) or *random* (counterfactual) proportions from the above contingency tables. For every cohort l, each component of the variance in Eq. 5 (i.e., the second moment and the squared mean) is regressed onto a series of dummies for whether the couple is homogamous with both partners having no education (reference category), both partners having primary education, secondary education, higher education, and partners having discordant levels of education (i.e., off-diagonals). After obtaining the betas (not shown, available upon request), expectations are computed multiplying the betas by either the observed or counterfactual proportions. This way, for each MC I estimate a variance computed under observed proportions, and a variance computed under counterfactual proportions. With these quantities, I compute the share of cohort-specific inequality attributable to educational assortative mating as follows:

$$\%ineq_l = \frac{VAR[W]_{l,observed} - VAR[W]_{l,counterfactual}}{VAR[W]_{l,observed}} \tag{6}$$

where $VAR[W]_{l,counterfactual} = (VAR|VAR_{mating=random})$.

How would wealth inequality change if we imposed random – instead of assortative – mating in each marriage cohort? Table 4 reports the variance under observed and random proportions, by urban/rural location of residence (panel a) and sub-region (panel b). Estimates for SSA as a whole (panel a) show that the share of inequality attributable to mating is low, reaching at most 3.7 percent in the latest MC. Further disaggregation unravels interesting heterogeneity, suggesting that only in urban areas mating explains a share of the cohort-specific inequality, albeit low. Heterogeneity by sub-region (panel b) also shows that the low shares accounted for by mating are driven primarily by Western Africa. Conversely, in Eastern Africa mating accounts for up to 12 percent of the cohort-specific inequality in wealth, followed in turn by Southern Africa (at most 10-11 percent) and Central Africa (at most 7 percent). High shares in Eastern Africa are aligned with the urban/rural differences identified in panel a, in that – as of 2014 – Eastern Africa has the lowest share of urban population (25 percent, against 44 percent in Western and Central Africa, and 61 percent in Southern Africa), yet it exhibits the highest urbanization rate within SSA, with an average annual increase in the urban population of 4.5 percent (UN-DESA 2015). Overall, these findings support the idea that educational assortative mating accounts for a non-negligible share of the cohort-specific inequality in wealth. These are not sizeable coefficients, yet they point to a link between educational assortative mating and household wealth inequality which has not been previously identified in the literature.

[Insert Table 4 about here]

Can changes in mating overtime explain time trends – mostly, the increase – in wealth inequality? To answer this question, I examine what would happen to wealth inequality if couples from the latest marriage cohort matched as those in the earliest ones. Methodologically, this entails re-computing the variance in the latest cohort (>=2005), applying the observed proportions from each earlier cohort. However, as changes in observed proportions are affected by shifts in marginal distributions, I use the Sinkhorn-Knopp algorithm (Sinkhorn and Knopp 1967) – an iterative procedure outlined in Mosteller (1968) and adopted by Greenwood *et al.* (2014) – to construct *standardized* contingency tables such that two contingency tables have the same marginal distributions associated with the rows and columns.[22] After imposing the marginal distributions of the latest MC to all preceding cohorts, I iteratively obtain the new observed proportions – those purged of compositional factors – and re-estimate the corresponding variances (e.g., the variance in the latest MC using the "corrected" observed proportions from the preceding MC) .

Table 5 provides results from the simulation exercise described above. The first two columns in each sub-panel rely on "uncorrected" (i.e., affected by differences in marginal distributions) observed proportions, while the last two columns rely on "corrected" (i.e., independent of differences in marginal distributions) observed proportions obtained through the iterative procedure. Focusing on unadjusted estimates for SSA as a whole (panel a), the first two columns suggest that wealth inequality in the latest cohort (>=2005) would be lower by about 19 percent if we imposed the observed pattern of mating from the earliest cohort (<1975), with trends very much driven by rural areas. The opposite trend is observed in urban areas, where wealth inequality would actually be larger if we imposed the observed pattern of mating from the earliest cohort (by 7 percent). However, once relying on adjusted estimates we observe that changes in mating hardly move time trends in wealth inequality, irrespective of location of residence (panel a) and sub-region (panel b). Ultimately, this exercise suggests that compositional changes in educational distributions – rather than changes in mating itself – are mainly responsible for explaining time trends in wealth inequality.

[Insert Table 5 about here]

Note that – differently from income and consumption expenditure data – IWIs and asset indices in general are not adjusted for household size or other demographic characteristics of the household. The reason is that the assets used for constructing these indices consist almost exclusively of household public goods, and housing characteristics, access to services and durables like a TV, fridge, clock, or car tend to benefit all household members (Smits and Steendijk 2015).[23] In any case, to provide a proxy for "crowding" and evaluate whether household characteristics explain any variability in the IWI, I re-estimate IWI variances controlling for some household characteristics, namely the total number of household members (residents plus visitors), a dummy for whether the partner lives in the household or elsewhere, the total number of sons living at home, and the total number of daughters living at home. Appendix Table A6 replicates panel a of Table 4 comparing variances computed under observed and random proportions, controlling for the above-listed household characteristics. Estimated variances are almost identical to those provided in Table 4, confirming findings from the literature (Filmer and Scott 2012; Rutstein and Johnson 2004; Sahn and Stifel 2000). This finding suggests I am not missing significant household-related variability in the estimation of variances.

Lastly, I conduct these analyses by country selecting the three countries where inequality has increased the most between the earliest and latest marriage cohort – namely, Guinea, Rwanda, and Uganda – and the three countries where inequality has increased the least (or has decreased) – Central African Republic, Congo, and Zimbabwe. Results – not reported but available upon request – show that even in these "extreme" cases changes in mating explain trends in wealth inequality to a negligible extent.

DISCUSSION AND CONCLUSIONS

This study has provided a comparative analysis of educational assortative mating across 39 countries in sub-Saharan Africa, a region of the world that has experienced rapid socio-economic and demographic change yet has been largely neglected in the assortative mating literature. Adopting a marriage-cohort temporal perspective and computing measures that net out the confounding role of shifting educational distributions, I have shown that mating in SSA has followed rather different trajectories both by sub-region and by household location of residence. While there is evidence of positive educational assortative mating throughout SSA – i.e., men and women with the same level of education marrying more frequently than what would be expected under a marriage pattern that is random with respect to education – mating has increased over subsequent cohorts in Western, Central, and Eastern Africa, yet it has flattened out and somewhat decreased in Southern Africa. Heterogeneity is also evident in levels and relative growth, as mating was lower in Western Africa for early cohorts, yet the sub-region has witnessed the steepest increase in the marital sorting parameter. Additionally, I have shown that increases in mating have been largely driven by rural areas – where the trend for SSA better conforms to the status attainment hypothesis – while mating in urban areas has shown a mild increase followed by an incipient decline – consistent with the inverted U-curve framework and the increasing applicability of the general openness hypothesis. Overall, the documented heterogeneity – and, foremost, the diverging trends between Western and Southern Africa – is consistent with the economic (e.g., urbanization), socio-demographic (e.g., changes in families), and cultural specificities (e.g., patriarchal norms) of each sub-region.

In the second part of the analysis I have explored implications of educational assortative mating for household wealth inequality measured through the International Wealth Index. Using counterfactual simulations both within and across-cohorts, I have shown that assortative mating accounts for a non-negligible share of the cohort-specific inequality in household wealth, which ranges sub-regionally between 3 and 12 percent and is wholly driven by urban areas. Mating accounts for a higher share of wealth inequality in Southern Africa – the most urbanized sub-region – and Eastern Africa – the sub-region that has experienced the highest rates of urbanization. Provided a link exists between time trends in mating and time trends in inequality, the steepest increases in mating in rural areas would have led us to expect the share of inequality attributable to mating to be higher in rural areas. Empirical evidence contradicts this expectation, as cross-cohort simulations show that changes in mating over time barely move the time trends in wealth inequality irrespective of household location of residence. This finding echoes the solid body of evidence from high-income societies claiming that mating plays a small to negligible role in explaining trends in household income inequality (Breen and Salazar 2011; Eika *et al.* 2017) and pushes to consider additional factors – missing in the present analysis – such as women's labor supply decisions (Gonalons-Pons and Schwartz 2017; Greenwood *et al.* 2014; etc.).

To the best of my knowledge, this is the first large-scale study focusing on trends, variation, and implications of mating in SSA. As such, it suffers from several limitations that set the stage for future research. First, the data and measures present limitations that relate to the nature and sampling frame of DHS data. As the DHS only provide data on the year of first union and include information on the education of the current partner – but not any previous one – the sample was limited to couples where women had been married only once, while no restrictions were imposed on men due to the lack of information on their marriage order. While this approach follows existing literature (e.g., Casterline *et al.* 1986) and well aligns with the claim that a focus on first marriages is what really matters for understanding mating patterns (Schwartz and Mare 2012), there is still room for improvement. However – at least as of now – there is no other dataset that would permit an analysis of mating patterns in SSA with analogous coverage.

Another possible source of concern in studies of mating is the classification of educational levels which, as stated by Blossfeld (2009), should be neither too crude nor too detailed to be informative. Ideally, it is key to define categories such that differences between them reflect well-chosen attainment levels with social significance. Only in that case increases in homogamy rates can really be interpreted as indicators of social closure, and increases in intermarriage as gains in social openness. Although the DHS collect educational variables similarly across countries and over time, making sure the above requirements are satisfied is always a challenge in broad-scale comparative studies.

Methodologically, this study – as many other studies of mating that build on cross-sectional data – takes marital matches as the starting point and attempts to explain trends and variation in mating through spouses' individual characteristics. As such, the analysis excludes all those individuals who are still single at the time of the interview. This is likely to create issues in societies with increasing single rates at the beginning of the life course. I believe in the SSA context this is less problematic, as getting married remains the largely predominant social norm for both men and women and virtually everyone eventually enters a union (Tabutin and Schoumaker 2004). Given the increasing proportion of never-married individuals in Southern Africa, this is likely the only sub-region in which this omission is likely to introduce some bias. Another methodological issue is tied to the scale of the analysis. As mating is ultimately determined by the availability of partners and potential matches, its functioning is more easily – and perhaps properly – understood at a finer level of analysis, such as districts or cities. As this study sought to provide an overview of patterns for the region as a whole (despite allowing for heterogeneity by sub-region and location of residence), this ultimately boils down to the usual trade-off between breadth of analysis and level of detail.

Lastly, the wealth analysis presents limitations that pertain to the type of measure used, which is the only available for most LMICs. The IWI has the advantage of easy reproducibility, as it builds on the same set of assets across countries. At the same time, its universality may be a drawback, as finding a small set of assets common to such a large number of surveys requires discarding a lot of the asset information gathered about any given household. Despite not being dismissive of asset indices, Harttgen *et al.* (2013) claimed that asset indices overstate the pace of poverty reduction as there is evidence of 'asset drift', i.e., an accumulation of assets over time, with households accumulating assets such as mobile phones and TVs without getting any less poor. Households often accumulate these assets because they are becoming relatively cheaper, preferences are shifting towards them, and households often do not dispose of them; but this does not mean that these households are any less poor as a result. Moreover, there is skepticism on whether asset indices may proxy for measures of income. In line with Sahn and Stifel (2003) and Filmer and Scott (2012), Smits and Steendijk (2015) claimed that asset indices are more indicators of longer-term, more stable, aspects of household's economic status, rather than monetary or expenditure-based welfare measures. Lastly, asset indices are measured at the household level, thus not providing information on the wealth distribution by gender. This might imply that if wealth is concentrated mostly among men, assortative mating would do little to shape wealth inequality. As such, it is not clear (yet) whether it makes sense to study mating patterns in relation to analyses of inequality based on asset measures. The high degree of consistency between my results and research on mating and inequality in high-income societies provides some reliability to the findings. Yet these are certainly not indisputable, and further advances in the field will permit to assess their robustness.

ENDNOTES

[1] Educational *homogamy* is defined as union formation between individuals who are similar in terms of education. The alternative is educational *heterogamy*, defined as union formation between individuals with different levels of education. Heterogamous couples can in turn be educationally *hypergamous* – if the female partner/wife has lower education than the male partner/husband – and educationally *hypogamous* – if the female partner/wife has higher education than the male partner/husband.

[2] Ntoimo and Mutanda (2017) is a notable exception, yet they examine patterns of homogamy and heterogamy in Ghana, Nigeria, and Zambia only. Another notable exception is Behrman (2018), who focuses on patterns of educational assortative mating across four Eastern African countries, namely Kenya, Malawi, Uganda, and Zimbabwe. Yet her study is aimed at examining the implications of mating for intimate partner violence, rather than providing a population-level overview of trends, determinants, and implications of mating.

[3] Throughout the paper I refer to the terms "wealth inequality" and "asset inequality" interchangeably.

[4] Niger (Western Africa) has the highest rate of child marriage in the world, followed – within the SSA context – by Central African Republic and Chad (Central Africa). These are also the regions in which arranged marriage is more commonly practiced.

[5] Trends in ages at first marriage are deeply intertwined with educational expansion and urbanization patterns. For instance, Mensch *et al.* (2006) reported that in Eastern and Southern Africa, more than four times as many women with 0 to 3 years of schooling married by age 18 as did women with 8-plus years of schooling. Similarly, 1.6 times as many women in rural areas married before age 18 as did women in urban areas.

[6] Smits, Ultee, and Lammers (2000) and Smits (2003) elaborated a fourth related hypothesis called the *saturation hypothesis*. This postulates a decrease in homogamy in modernizing societies which slows down and eventually stops in societies that have reached a high level of openness. As this hypothesis is more applicable to highly industrialized societies that are far from the sub-Saharan countries included in this study, I leave it aside.

[7] Note that part of this process is contingent on realizing the income potential once the couple is formed, which tends to be achieved through post-marital labor supply decisions (Breen and Andersen 2012; Gonalons-Pons and Schwartz 2017).

[8] Note that the first and last cohorts span more than five years for sample size reasons.

[9] The couple-level file is not available for every country, and the sample of couples would be restricted by about two-thirds.

[10] Throughout the paper I use the terms "husband" and "male partner", "wife" and "female partner", and "marriage" and "union" interchangeably.

[11] DHS include a question on the total number of unions the woman has been in: "Have you been married or lived with a man only once or more than once?". All women reporting two or more unions are considered to have ever been remarried. Note that the sample is not restricted to men who have only married once. Indeed, the high prevalence of polygyny, particularly in Western Africa, suggests that many of the sampled men have married more than once (Fenske 2015; Reniers and Tfaily 2012; Smith-Greenaway and Trinitapoli 2014; Wagner and Rieger 2015).

[12] Due to a high number of missing cases in the age of the current partner/husband, the number of couples for these age-analyses is reduced to 373,831.

[13] Information on 12 assets is needed to compute the IWI of a household. These assets include seven consumer durables (possession of a TV, fridge, phone, bike, car, a cheap utensil and an expensive utensil), access to two public services (water and electricity) and three housing

characteristics (number of sleeping rooms, quality of floor material and of toilet facility). For additional details on the IWI see Smits and Steendijk (2015).

[14] There is only one DHS survey for Botswana collected in 1988. The IWI for this country is not available, hence the country is not included in the wealth analysis. The survey waves that are excluded in the wealth analysis due to the unavailability of the IWI are reported in Appendix Table A1 in italic.

[15] Not all ten marriage cohorts are available for each country, especially if only one survey wave per country is available. For instance, there is only one DHS for Angola, collected in 2015. As only women 25-40 are included in the sample, the oldest women were born around 1975 and entered their first union around 1990. Hence, the first marriage cohort available for Angola is the 1990-1994 one. These discrepancies are likely to create issues when analyzing trends at the country level, but less so when trends are analyzed at the sub-regional level, as mostly done in this paper.

[16] Proportions under random mating are the expected frequencies under the independence assumption (i.e. the product of the marginal distributions for husbands and wives). For explanatory purposes, contingency tables by marriage cohort for SSA as a whole are reported in Appendix Table A3.

[17] Kendall's tau is a measure of rank correlation, given by the difference between the number of concordant and discordant pairs of couples relative to the total number of pairs of couples. A pair of couples is said to be concordant if both the wife and husband in one couple have higher education than the wife and husband in the other couple. The pair of couples is discordant if one couple has a wife with lower education and a husband with higher education as compared to the other couple. The Kendall correlation ranges from -1 to 1 and it is closer to 1 the more similar the ranks of the spouses are in the marginal distribution of education of husbands and wives.

[18] The model in which the husband-wife association is assumed to be both time-invariant and region-invariant (i.e., HRM and WRM, excluding HWM and HWR) has a deviance of 4,365 and a positive BIC of 3,308. As the model fits the data poorly by conventional standards, it is not reported in the analysis – yet it is available upon request.

[19] The variable is created as 0 if husband and wife have the same education, 1 if the husband "marries down" and 2 if the husband "marries up" – irrespective of how many educational categories there are between husband and wife (e.g., the variable is 1 both for the pairing "husband-higher education" and "wife-no education" and the pairing "husband-higher education" and "wife-secondary education").

[20] Also, as households/couples in more recent cohorts have likely had less time to accumulate assets/wealth, by widening the horizon to ten years we are likely to obtain a more representative and balanced picture.

[21] Data on income inequality are more readily available and show that SSA remains one of the most unequal regions in the world. Ten of the 19 most unequal countries globally are in SSA and seven outlier African countries drive this inequality. Between 1991 and 2011, 17 countries (predominantly agricultural economies from West Africa and a few from other regions) experienced declining inequality, whereas 12 countries, predominantly in Southern and Central Africa and economies characterized by an important oil and mining sector, recorded an inequality rise (UNDP 2017). Although asset measures largely differ from income measures, there is a good degree of consistency between the maps I provide and the UNDP findings on income inequality, especially for what concerns Southern African countries such as Botswana, Lesotho, Namibia, South Africa, Zimbabwe, etc.

[22] The basic idea is to fix the marginal distributions of a contingency table and rework the internal cells such that the "new" marginal distributions are respected. Once two contingency tables have

the same marginal distributions, the cells within the table can be compared. Taking a 4x4 table, this can be standardized so that each element of the two marginal distributions is ¼.

[23] As explained in Smits and Steendijk (2015), in some studies the number of sleeping rooms is divided by the number of persons in the household, to obtain an indicator of "crowding". For IWI this is not the case, as the number of rooms is meant to be an indicator of the size of the house and not of crowding. A house with three sleeping rooms is generally bigger and more expensive than a house with less sleeping rooms and this is independent of family size.

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Tables

Table 1: Number of countries and survey waves included in the analysis, by region of sub-Saharan Africa

Regional classification of Sub-Saharan African countries			
Western	**Central**	**Eastern**	**Southern**
Benin (4)	Angola (1)	Burundi (2)	Botswana (1)
Burkina Faso (4)	Cameroon (4)	Comoros (2)	Lesotho (3)
Cote d'Ivoire (2)	Central African Republic (1)	Ethiopia (4)	Namibia (4)
Gambia (1)	Chad (3)	Kenya (6)	South Africa (1)
Ghana (6)	Congo (2)	Madagascar (4)	Swaziland (1)
Guinea (3)	Congo, DR (2)	Malawi (5)	
Liberia (3)	Gabon (2)	Mozambique (3)	
Mali (4)	Sao Tome and Principe (1)	Rwanda (5)	
Mauritania (1)		Tanzania (5)	
Niger (4)		Uganda (5)	
Nigeria (4)		Zambia (5)	
Senegal (7)		Zimbabwe (6)	
Sierra Leone (2)			
Togo (3)			
14 countries - 48 surveys	**8 countries - 16 surveys**	**12 countries - 52 surveys**	**5 countries - 10 surveys**

Notes: Regional classification from the United Nations Statistics Division (UNSD). Number of survey waves in parentheses.

Table 2: Summary statistics on couples' education, by marriage cohort

Marriage cohort	a. Highest level attained					b. Grade attained				
		Wife		Husband			Wife		Husband	
	N	Average	Ratio over <1970	Average	Ratio over <1970	N	Average	Ratio over <1970	Average	Ratio over <1970
<1970	4,956	0.32	.	0.54	.	4,893	1.43	.	2.71	.
		(0.011)		(0.015)			(0.055)		(0.081)	
1970-1974	12,718	0.40	1.2	0.62	1.1	12,536	1.83	1.3	3.09	1.1
		(0.008)		(0.010)			(0.042)		(0.059)	
1975-1979	25,384	0.46	1.4	0.67	1.2	24,959	2.18	1.5	3.37	1.2
		(0.007)		(0.009)			(0.036)		(0.047)	
1980-1984	40,607	0.55	1.7	0.75	1.4	40,069	2.62	1.8	3.76	1.4
		(0.006)		(0.008)			(0.032)		(0.040)	
1985-1989	55,511	0.63	2.0	0.83	1.6	54,927	3.00	2.1	4.19	1.5
		(0.006)		(0.007)			(0.030)		(0.037)	
1990-1994	74,626	0.68	2.1	0.91	1.7	73,977	3.26	2.3	4.57	1.7
		(0.006)		(0.007)			(0.030)		(0.036)	
1995-1999	82,918	0.79	2.5	1.02	1.9	82,293	3.82	2.7	5.17	1.9
		(0.006)		(0.007)			(0.032)		(0.038)	
2000-2004	69,789	0.93	2.9	1.15	2.1	69,358	4.56	3.2	5.89	2.2
		(0.007)		(0.008)			(0.038)		(0.043)	
2005-2009	37,903	1.22	3.8	1.39	2.6	37,633	6.11	4.3	7.21	2.7
		(0.010)		(0.010)			(0.055)		(0.057)	
>=2010	11,626	1.62	5.1	1.72	3.2	11,565	8.31	5.8	9.05	3.3
		(0.017)		(0.016)			(0.092)		(0.092)	
Total	416,038					412,210				

Notes: Weighted estimates using sample DHS weights. Standard errors in parentheses. "Ratio over <1970" gives the relative ratio of the value in each cohort compared to the <1970 one, i.e., the earliest.

Table 3: Log-linear models for the association between partners' educational attainment, by household location of residence

a. Overall

Model	*df*	Deviance	BIC
(1) HRM, WRM, HWR	153	702.55	-196.3
(2) Model 1 + HWM	109	304.12	-176.2
(3) Model 1 + OM	148	671.03	-198.5
(4) Model 1 + DM	133	568.06	-213.3
(5) Model 1 + AM	143	589.47	-250.6
(6) Model 1 + CM	138	581.55	-229.2
(7) Model 1 + OMR	133	484.49	-296.9
(8) Model 1 + DMR	76	305.49	-141.0
(9) Model 1 + AMR	113	375.44	-288.4
(10) Model 1 + CMR	96	354.91	-241.0
(11) Model 7 + DM	118	413.70	-279.5
(12) Model 7 + AM	128	414.80	-337.2
(13) Model 7 + CM	118	337.60	-325.6
(14) Model 7 + CMR	76	224.58	-221.9

b. Urban

Model	*df*	Deviance	BIC
(1) HRM, WRM, HWR	140	322.69	-492.9
(2) Model 1 + HWM	98	198.01	-372.9
(3) Model 1 + OM	135	310.07	-476.4
(4) Model 1 + DM	121	272.14	-432.8
(5) Model 1 + AM	130	281.16	-476.2
(6) Model 1 + CM	126	279.05	-455.0
(7) Model 1 + OMR	121	260.25	-444.7
(8) Model 1 + DMR	67	169.02	-221.3
(9) Model 1 + AMR	102	191.73	-402.5
(10) Model 1 + CMR	86	181.18	-319.9

c. Rural

Model	*df*	Deviance	BIC
(1) HRM, WRM, HWR	132	351.12	-403.6
(2) Model 1 + HWM	91	229.50	-297.7
(3) Model 1 + OM	127	340.06	-395.7
(4) Model 1 + DM	113	283.14	-371.5
(5) Model 1 + AM	122	315.49	-391.3
(6) Model 1 + CM	118	317.93	-365.6
(7) Model 1 + OMR	112	230.72	-418.1
(8) Model 1 + DMR	61	122.83	-230.5
(9) Model 1 + AMR	94	197.46	-347.1
(10) Model 1 + CMR	79	144.77	-312.9
(11) Model 7 + DM	98	193.12	-374.6
(12) Model 7 + AM	107	212.17	-409.7
(13) Model 7 + CM	98	188.58	-379.1
(14) Model 7 + CMR	61	106.79	-246.6

Notes: Model terms: H=husband's education; W=wife's education; R=region; M=marriage cohort; O=homogamy (reduced homogamy); D=main diagonal (expanded homogamy); A=marrying up/down (asymmetry); C=crossing parameters.

Table 4: Cohort-specific variance in wealth (IWI) under observed and random mating scenarios, by location of residence (top panel) and region of sub-Saharan Africa (bottom panel)

a.	**Overall**			**Urban**			**Rural**		
Marriage cohort	Variance (observed)	Variance (random)	% ineq.	Variance (observed)	Variance (random)	% ineq.	Variance (observed)	Variance (random)	% ineq.
<1975	328.1	316.6	3.5%	607.3	584.9	3.7%	116.7	116.7	0.0%
1975-1984	434.8	429.1	1.3%	681.9	646.6	5.2%	154.7	156.3	-1.0%
1985-1994	512.3	514.8	-0.5%	635.9	614.2	3.4%	220.1	223.8	-1.7%
1995-2004	584.0	576.0	1.4%	560.1	533.5	4.7%	271.4	269.6	0.7%
>=2005	717.4	690.7	3.7%	474.9	454.0	4.4%	356.3	348.7	2.1%

b.	**Western**			**Central**			**Eastern**			**Southern**		
Marriage cohort	Variance (observed)	Variance (random)	% ineq.	Variance (observed)	Variance (random)	% ineq.	Variance (observed)	Variance (random)	% ineq.	Variance (observed)	Variance (random)	% ineq.
<1975	323.7	331.2	-2.3%	363.5	339.0	6.8%	280.3	246.3	12.1%	914.8	819.5	10.4%
1975-1984	364.9	376.5	-3.2%	415.6	382.2	8.0%	383.9	336.5	12.3%	1084.7	999.6	7.8%
1985-1994	460.3	464.6	-0.9%	586.9	584.6	0.4%	427.5	381.5	10.8%	984.7	923.0	6.3%
1995-2004	546.9	534.4	2.3%	638.2	629.4	1.4%	503.5	444.3	11.8%	869.2	807.7	7.1%
>=2005	594.3	568.0	4.4%	843.6	800.3	5.1%	653.5	593.2	9.2%	776.7	694.4	10.6%

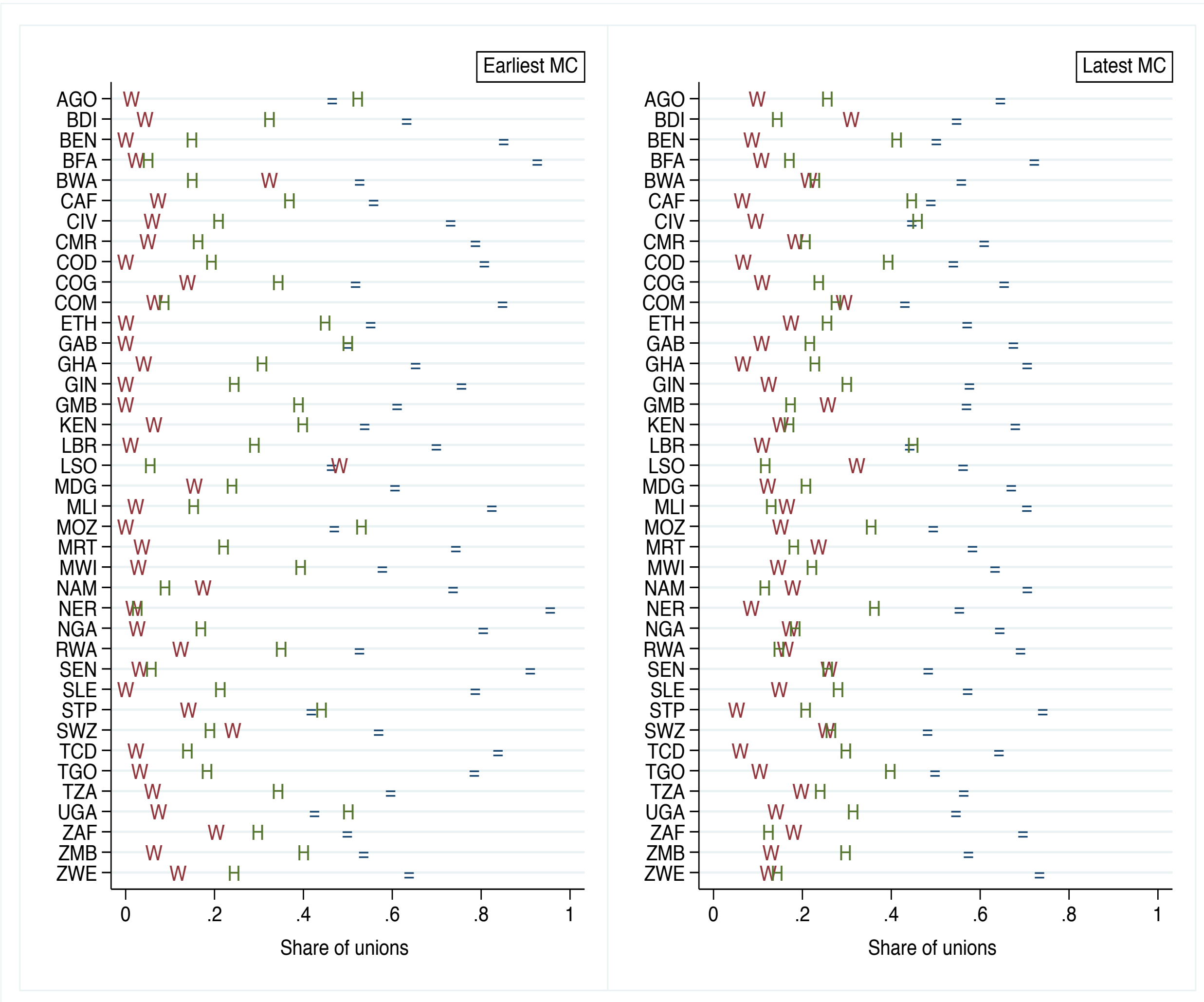
Table 5: Variance in wealth (IWI) for the latest marriage cohort (>=2005) under different counterfactual distributions

a.	Overall				Urban				Rural			
			Fixed MD (latest)				*Fixed MD (latest)*				*Fixed MD (latest)*	
Counterfactual distribution	Variance latest MC	% change	Variance latest MC	% change	Variance latest MC	% change	Variance latest MC	% change	Variance latest MC	% change	Variance latest MC	% change
>=2005	717.4	.	717.4	.	474.9	.	474.9	.	356.3	.	356.3	.
1995-2004	656.4	-8.5%	719.1	0.2%	483.4	1.8%	474.8	0.0%	330.0	-7.4%	356.3	0.0%
1985-1994	624.6	-12.9%	717.6	0.0%	490.6	3.3%	475.1	0.0%	321.0	-9.9%	355.6	-0.2%
1975-1984	598.1	-16.6%	720.8	0.5%	500.7	5.4%	475.5	0.1%	311.9	-12.4%	357.0	0.2%
<1975	578.4	-19.4%	722.5	0.7%	506.8	6.7%	476.9	0.4%	307.8	-13.6%	353.6	-0.8%

b.	Western				Central				Eastern				Southern			
			Fixed MD (latest)				*Fixed MD (latest)*				*Fixed MD (latest)*				*Fixed MD (latest)*	
Counterfactual distribution	Variance latest MC	% change	Variance latest MC	% change	Variance latest MC	% change	Variance latest MC	% change	Variance latest MC	% change	Variance latest MC	% change	Variance latest MC	% change	Variance latest MC	% change
>=2005	594.3	.	594.3	.	843.6	.	843.6	.	653.5	.	653.5	.	776.7	.	776.7	.
1995-2004	580.6	-2.3%	596.5	0.4%	780.7	-7.5%	847.9	0.5%	562.7	-13.9%	655.3	0.3%	731.6	-5.8%	773.3	-0.4%
1985-1994	559.9	-5.8%	595.4	0.2%	743.0	-11.9%	846.4	0.3%	534.9	-18.1%	655.2	0.3%	709.5	-8.7%	776.4	0.0%
1975-1984	539.2	-9.3%	596.7	0.4%	670.1	-20.6%	851.5	0.9%	514.0	-21.3%	662.9	1.4%	688.9	-11.3%	776.8	0.0%
<1975	521.5	-12.3%	594.7	0.1%	562.8	-33.3%	817.2	-3.1%	497.4	-23.9%	664.1	1.6%	641.9	-17.4%	779.2	0.3%

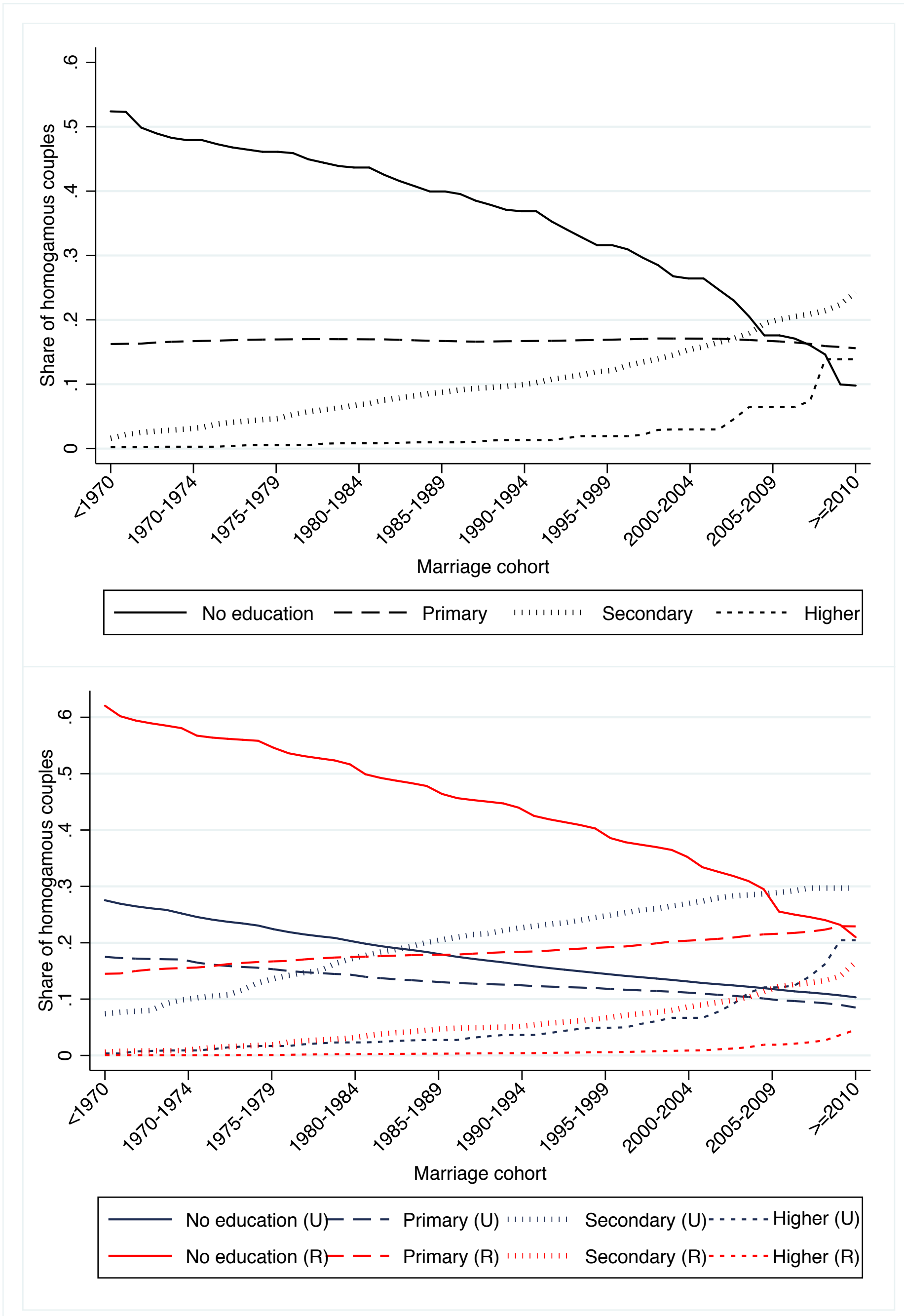
Figures

Figure 1: Share of homogamous (=), hypergamous (H), and hypogamous (W) unions for the earliest (left panel) and latest (right panel) marriage cohorts for each country



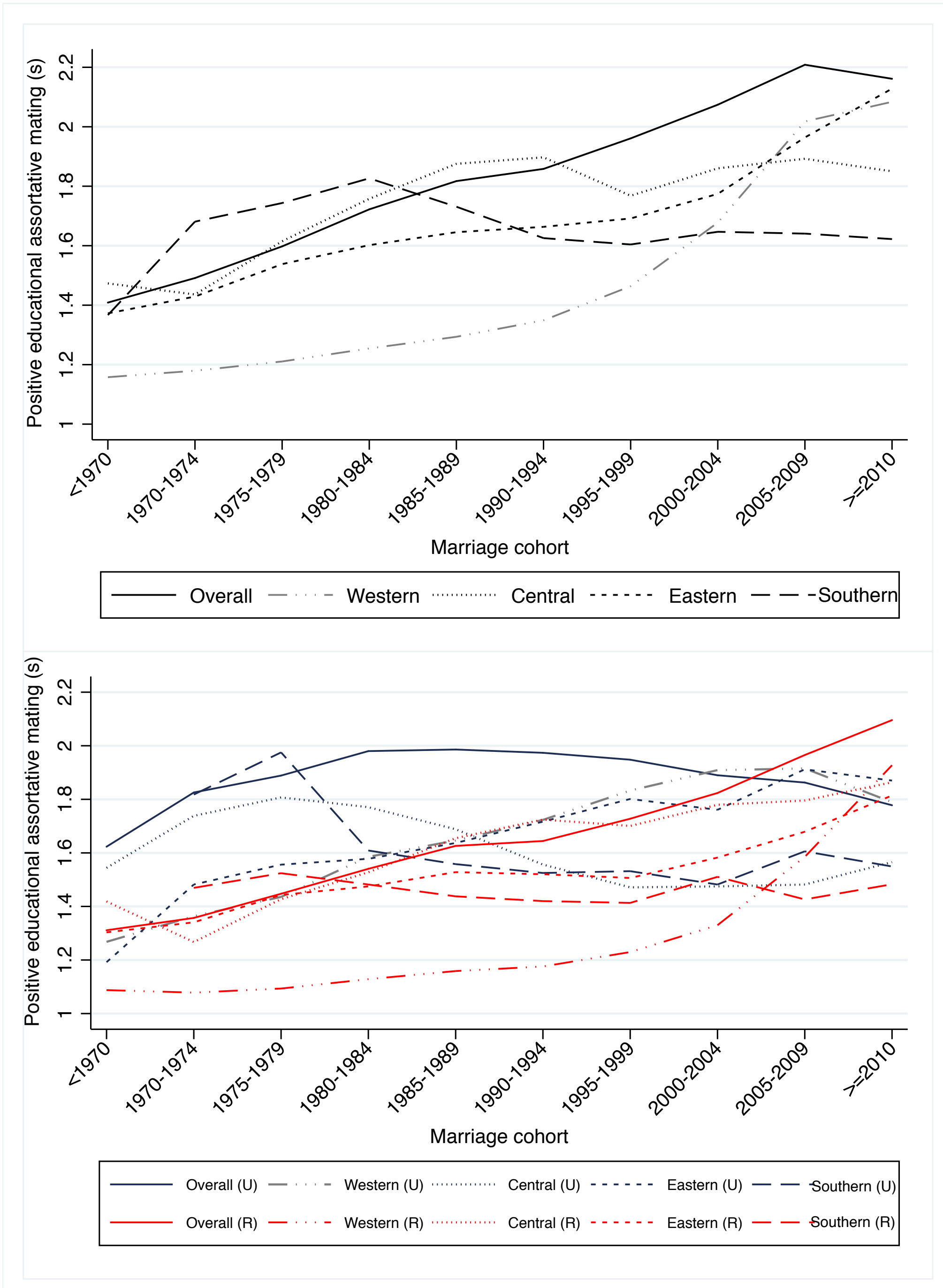
Notes: MC: marriage cohort. "W": Men<Women; "=": Men=Women; "H": Men>Women. Country codes: AGO-Angola; BDI-Burundi; BEN-Benin; BFA-Burkina Faso; BWA-Botswana; CAF-Central African Republic; CIV-Côte d'Ivoire; CMR-Cameroon; COD-Democratic Republic of the Congo; COG-Congo; COM-Comoros; ETH-Ethiopia; GAB-Gabon; GHA-Ghana; GIN-Guinea; GMB-Gambia; KEN-Kenya; LBR-Liberia; LSO-Lesotho; MDG-Madagascar; MLI-Mali; MOZ-Mozambique; MRT-Mauritania; MWI-Malawi; NAM-Namibia; NER-Niger; NGA-Nigeria; RWA-Rwanda; SEN-Senegal; SLE-Sierra Leone; STP-Sao Tome and Principe; SWZ-Swaziland; TCD-Chad; TGO-Togo; TZA-Tanzania; UGA-Uganda; ZAF-South Africa; ZMB-Zambia; ZWE-Zimbabwe.

Figure 2: Share of homogamous couples by educational level, for sub-Saharan Africa as a whole (top panel) and by location of residence (bottom panel)



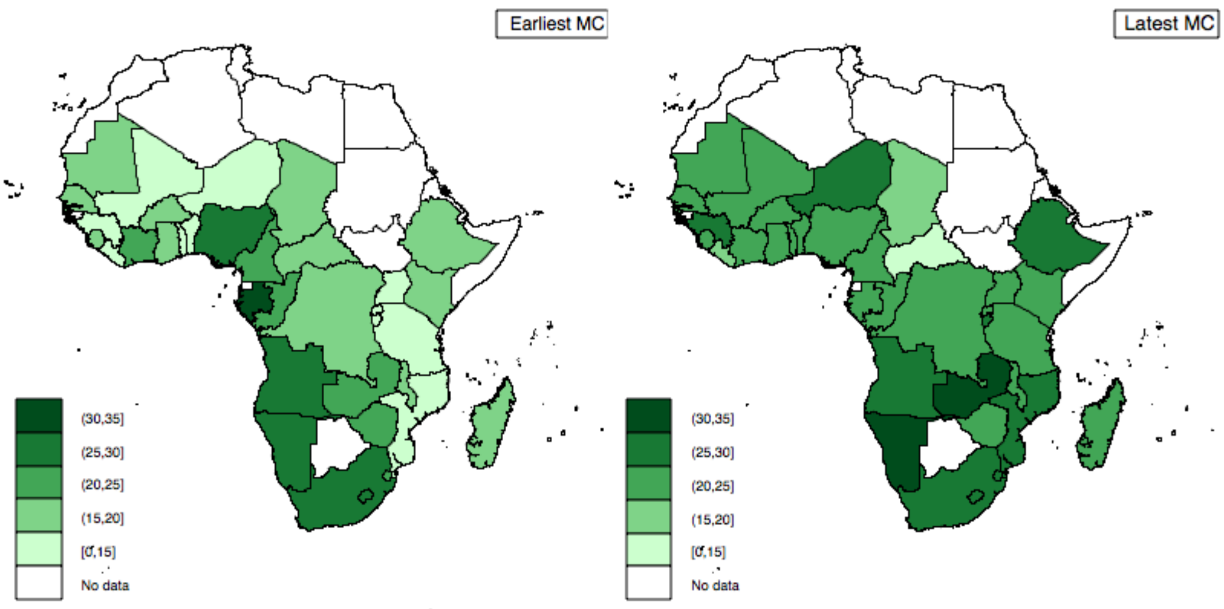
Notes: "U": urban; "R": rural.

Figure 3: Positive educational assortative mating (s parameter), by region of sub-Saharan Africa (top panel) and location of residence (bottom panel)



Notes: "U": urban; "R": rural.

Figure 4: Wealth dispersion (SD in IWI) for the earliest (left panel) and latest (right panel) marriage cohort, by sub-Saharan African country



Appendix Tables

Table A1: Number of countries, survey waves, and couples per wave included in the analysis, by region of sub-Saharan Africa

Western (14 countries - 48 surveys)	**Central (8 countries - 16 surveys)**	**Eastern (12 countries - 52 surveys)**	**Southern (5 countries - 10 surveys)**
Benin	Angola	Burundi	Botswana
1996 (3,362)	2015 (6,764)	*1987 (2,718)*	*1988 (1,998)*
2001 (3,994)	Cameroon	2010 (5,572)	Lesotho
2006 (13,272)	*1991 (1,035)*	Comoros	2004 (1,803)
2011 (13,438)	1998 (1,403)	1996 (621)	2009 (2,059)
Burkina Faso	2004 (2,605)	2012 (1,345)	2014 (1,914)
1993 (4,346)	2011 (3,917)	Ethiopia	Namibia
1998 (4,490)	Central African Republic	2000 (3,623)	1992 (1,024)
2003 (8,682)	1994 (2,518)	2005 (4,001)	2000 (1,339)
2010 (13,082)	Chad	2011 (4,943)	2006 (1,761)
Cote d'Ivoire	1996 (2,351)	2016 (5,039)	2013 (1,690)
1994 (2,260)	2004 (1,880)	Kenya	South Africa
2011 (2,977)	2014 (6,644)	*1989 (2,568)*	1998 (2,838)
Gambia	Congo	1993 (2,453)	Swaziland
2013 (3,373)	2005 (3,210)	1998 (2,594)	2006 (1,081)
Ghana	2011 (2,635)	2003 (2,543)	
1988 (1,157)	Congo, DR	2008 (2,696)	
1993 (1,300)	2007 (5,460)	2014 (5,185)	
1998 (1,347)	2013 (11,242)	Madagascar	
2003 (1,581)	Gabon	1992 (1,377)	
2008 (1,325)	2000 (1,163)	1997 (1,608)	
2014 (2,755)	2012 (1,614)	2003 (2,113)	
Guinea	Sao Tome and Principe	2008 (4,572)	
1999 (2,551)	2008 (590)	Malawi	
2005 (2,966)		1992 (1,236)	
2012 (3,219)		2000 (3,389)	
Liberia		2004 (3,024)	
1986 (1,021)		2010 (6,470)	
2007 (1,733)		2015 (6,905)	
2013 (2,304)		Mozambique	
Mali		1997 (1,921)	
1995 (3,652)		2003 (2,923)	
2001 (4,790)		2011 (3,502)	
2006 (5,396)		Rwanda	
2012 (4,871)		1992 (2,014)	
Mauritania		2000 (2,405)	
2000 (1,763)		2005 (2,779)	
Niger		2010 (3,999)	
1992 (1,954)		2014 (4,261)	
1998 (2,209)		Tanzania	
2006 (3,188)		1991 (2,347)	
2012 (4,515)		1996 (2,288)	
Nigeria		2004 (2,966)	
1990 (3,427)		2010 (2,791)	
2003 (2,389)		2015 (3,665)	
2008 (12,081)		Uganda	
2013 (14,025)		*1988 (1,117)*	
Senegal		1995 (1,741)	
1986 (1,274)		2000 (1,829)	
1992 (1,817)		2006 (2,317)	
2005 (3,887)		2011 (2,496)	
2010 (4,846)		Zambia	
2012 (2,488)		*1992 (1,704)*	

2014 (2,553)	1996 (1,841)
2015 (2,724)	2001 (1,862)
Sierra Leone	2007 (1,942)
2008 (2,561)	2013 (4,623)
2013 (5,108)	Zimbabwe
Togo	*1988 (1,228)*
1988 (967)	1994 (1,714)
1998 (2,780)	1999 (1,615)
2013 (3,328)	2005 (2,251)
	2010 (2,672)
	2015 (2,964)

Notes: Regional classification from the United Nations Statistics Division (UNSD). Number of couples per wave in parentheses. The 14 survey waves for which no IWI is available are reported in italic.

Table A2: Summary statistics on couples' age, by marriage cohort

Marriage cohort	N	Age			
		Wife	Husband	Diff.	Ratio over <1970
<1970	258	39.50	50.61	11.11	
		(0.069)	(0.603)	(0.594)	
1970-1974	3,285	38.49	49.26	10.77	0.97
		(0.041)	(0.193)	(0.184)	
1975-1979	11,665	36.71	46.99	10.28	0.92
		(0.039)	(0.120)	(0.111)	
1980-1984	28,545	34.96	44.78	9.82	0.88
		(0.045)	(0.083)	(0.068)	
1985-1989	49,810	33.59	42.94	9.34	0.84
		(0.041)	(0.067)	(0.051)	
1990-1994	73,873	32.53	41.32	8.79	0.79
		(0.033)	(0.052)	(0.043)	
1995-1999	84,241	30.92	39.14	8.22	0.74
		(0.027)	(0.045)	(0.040)	
2000-2004	71,309	29.25	36.80	7.55	0.68
		(0.025)	(0.046)	(0.042)	
2005-2009	38,862	28.31	34.94	6.63	0.60
		(0.027)	(0.053)	(0.048)	
>=2010	11,983	28.26	34.17	5.91	0.53
		(0.049)	(0.098)	(0.084)	
Total	373,831				

Notes: Weighted estimates using sample DHS weights. Standard errors in parentheses. "Ratio over <1970" gives the relative ratio of the value in each cohort compared to the <1970 one, i.e., the earliest.

Table A3: Contingency tables (actual and random mating) by marriage cohort, sub-Saharan Africa as a whole

	<1970							
	No Education (W)		Primary (W)		Secondary (W)		Higher (W)	
	Assortative	Random	Assortative	Random	Assortative	Random	Assortative	Random
No Education (H)	**0.524**	**0.411**	0.051	0.148	0.001	0.016	0.000	0.001
Primary (H)	0.161	0.231	**0.157**	**0.083**	0.005	0.009	0.000	0.001
Secondary (H)	0.026	0.062	0.046	0.023	**0.016**	**0.002**	0.000	0.000
Higher (H)	0.003	0.009	0.003	0.003	0.005	0.000	**0.002**	**0.000**
Marginal	0.713		0.257		0.027		0.002	
	1970-1974							
	No Education (W)		Primary (W)		Secondary (W)		Higher (W)	
	Assortative	Random	Assortative	Random	Assortative	Random	Assortative	Random
No Education (H)	**0.479**	**0.355**	0.053	0.151	0.003	0.027	0.000	0.002
Primary (H)	0.158	0.220	**0.166**	**0.094**	0.009	0.017	0.000	0.001
Secondary (H)	0.023	0.075	0.059	0.032	**0.031**	**0.006**	**0.001**	**0.000**
Higher (H)	0.003	0.012	0.005	0.005	0.008	0.001	0.003	0.000
Marginal	0.663		0.283		0.051		0.004	
	1975-1979							
	No Education (W)		Primary (W)		Secondary (W)		Higher (W)	
	Assortative	Random	Assortative	Random	Assortative	Random	Assortative	Random
No Education (H)	**0.461**	**0.323**	0.049	0.148	0.004	0.039	0.000	0.004
Primary (H)	0.140	0.204	**0.170**	**0.094**	0.015	0.025	0.000	0.002
Secondary (H)	0.026	0.087	0.065	0.040	**0.047**	**0.011**	0.001	0.001
Higher (H)	0.002	0.014	0.005	0.006	0.011	0.002	**0.005**	**0.000**
Marginal	0.628		0.288		0.076		0.007	
	1980-1984							
	No Education (W)		Primary (W)		Secondary (W)		Higher (W)	
	Assortative	Random	Assortative	Random	Assortative	Random	Assortative	Random
No Education (H)	**0.437**	**0.287**	0.049	0.145	0.006	0.054	0.000	0.005
Primary (H)	0.114	0.178	**0.170**	**0.090**	0.021	0.033	0.000	0.003
Secondary (H)	0.030	0.099	0.070	0.050	**0.067**	**0.019**	0.002	0.002
Higher (H)	0.003	0.020	0.006	0.010	0.016	0.004	**0.008**	**0.000**
Marginal	0.584		0.296		0.109		0.011	
	1985-1989							
	No Education (W)		Primary (W)		Secondary (W)		Higher (W)	
	Assortative	Random	Assortative	Random	Assortative	Random	Assortative	Random
No Education (H)	**0.399**	**0.246**	0.049	0.138	0.006	0.064	0.000	0.006
Primary (H)	0.104	0.162	**0.169**	**0.091**	0.027	0.043	0.000	0.004
Secondary (H)	0.034	0.110	0.078	0.062	**0.088**	**0.029**	0.003	0.003
Higher (H)	0.004	0.023	0.008	0.013	0.022	0.006	**0.010**	**0.001**
Marginal	0.541		0.304		0.142		0.014	
	1990-1994							
	No Education (W)		Primary (W)		Secondary (W)		Higher (W)	
	Assortative	Random	Assortative	Random	Assortative	Random	Assortative	Random
No Education (H)	**0.369**	**0.219**	0.048	0.130	0.007	0.067	0.000	0.008
Primary (H)	0.104	0.152	**0.163**	**0.090**	0.026	0.047	0.001	0.006
Secondary (H)	0.038	0.118	0.086	0.070	**0.099**	**0.036**	0.005	0.004
Higher (H)	0.004	0.027	0.009	0.016	0.026	0.008	**0.013**	**0.001**
Marginal	0.516		0.307		0.159		0.019	
	1995-1999							
	No Education (W)		Primary (W)		Secondary (W)		Higher (W)	
	Assortative	Random	Assortative	Random	Assortative	Random	Assortative	Random
No Education (H)	**0.316**	**0.171**	0.050	0.121	0.007	0.072	0.000	0.010
Primary (H)	0.099	0.139	**0.172**	**0.098**	0.032	0.058	0.001	0.008
Secondary (H)	0.039	0.119	0.093	0.084	**0.122**	**0.050**	0.007	0.007
Higher (H)	0.005	0.029	0.009	0.021	0.032	0.012	**0.019**	**0.002**
Marginal	0.458		0.323		0.192		0.027	
	2000-2004							

	No Education (W)		Primary (W)		Secondary (W)		Higher (W)	
	Assortative	Random	Assortative	Random	Assortative	Random	Assortative	Random
No Education (H)	**0.264**	**0.126**	0.045	0.104	0.010	0.077	0.000	0.013
Primary (H)	0.086	0.117	**0.171**	**0.096**	0.038	0.071	0.001	0.012
Secondary (H)	0.038	0.119	0.100	0.098	**0.154**	**0.073**	0.010	0.012
Higher (H)	0.005	0.032	0.009	0.027	0.039	0.020	**0.030**	**0.003**
Marginal	0.393		0.325		0.241		0.041	
2005-2009								
	No Education (W)		Primary (W)		Secondary (W)		Higher (W)	
	Assortative	Random	Assortative	Random	Assortative	Random	Assortative	Random
No Education (H)	**0.176**	**0.065**	0.043	0.073	0.013	0.074	0.001	0.021
Primary (H)	0.065	0.079	**0.170**	**0.089**	0.045	0.090	0.003	0.025
Secondary (H)	0.033	0.097	0.094	0.110	**0.200**	**0.110**	0.021	0.031
Higher (H)	0.005	0.038	0.008	0.043	0.059	0.043	**0.065**	**0.012**
Marginal	0.278		0.316		0.317		0.090	
>=2010								
	No Education (W)		Primary (W)		Secondary (W)		Higher (W)	
	Assortative	Random	Assortative	Random	Assortative	Random	Assortative	Random
No Education (H)	**0.098**	**0.024**	0.031	0.037	0.016	0.058	0.002	0.028
Primary (H)	0.037	0.036	**0.128**	**0.056**	0.050	0.087	0.006	0.043
Secondary (H)	0.023	0.064	0.083	0.100	**0.243**	**0.156**	0.048	0.077
Higher (H)	0.003	0.038	0.010	0.060	0.085	0.093	**0.139**	**0.046**
Marginal	0.161		0.252		0.394		0.194	

Table A4: Relative sum of diagonals of cohort-specific contingency tables (observed mating/random mating)

Marriage cohort	Relative sum of diagonals of cohort-specific contingency tables (actual mating/random mating)														
	Overall			**Western**			**Central**			**Eastern**			**Southern**		
	All	Urban	Rural	All	Urban	Rural	All	Urban	Rural	All	Urban	Rural	All	Urban	Rural
<1970	1.409	1.623	1.311	1.158	1.268	1.088	1.473	1.544	1.419	1.373	1.192	1.303	1.367	.	.
1970-1974	1.491	1.826	1.357	1.180	1.363	1.078	1.436	1.738	1.267	1.429	1.482	1.341	1.681	1.818	1.469
1975-1979	1.598	1.889	1.447	1.211	1.436	1.093	1.615	1.807	1.427	1.538	1.556	1.443	1.744	1.975	1.524
1980-1984	1.722	1.980	1.540	1.254	1.585	1.128	1.758	1.771	1.528	1.602	1.578	1.475	1.827	1.609	1.482
1985-1989	1.817	1.986	1.626	1.294	1.646	1.159	1.875	1.688	1.655	1.645	1.637	1.528	1.731	1.558	1.438
1990-1994	1.858	1.974	1.644	1.349	1.723	1.176	1.897	1.556	1.724	1.663	1.717	1.520	1.625	1.525	1.420
1995-1999	1.961	1.948	1.728	1.464	1.833	1.230	1.768	1.471	1.701	1.692	1.801	1.506	1.604	1.532	1.413
2000-2004	2.074	1.890	1.824	1.678	1.909	1.330	1.860	1.475	1.780	1.774	1.761	1.582	1.647	1.482	1.511
2005-2009	2.209	1.863	1.965	2.018	1.915	1.585	1.892	1.482	1.796	1.964	1.912	1.679	1.641	1.606	1.426
>=2010	2.161	1.778	2.096	2.084	1.789	1.927	1.850	1.565	1.863	2.128	1.870	1.814	1.622	1.549	1.483

Table A5: Association between wealth dispersion (SD) and marriage cohort

IWI (SD)		**a. All**		**b. Urban**		**c. Rural**	
		(1)	(2)	(1)	(2)	(1)	(2)
Marriage cohort (Ref.<1975)							
	1975-1984	2.036***	1.846***	2.441***	1.916***	1.859***	1.803***
		(0.070)	(0.068)	(0.173)	(0.126)	(0.077)	(0.079)
	1985-1994	3.673***	3.412***	3.911***	3.351***	3.475***	3.390***
		(0.078)	(0.074)	(0.192)	(0.139)	(0.086)	(0.086)
	1995-2004	4.984***	4.626***	4.884***	4.250***	4.807***	4.727***
		(0.080)	(0.074)	(0.198)	(0.139)	(0.089)	(0.086)
	>=2005	7.055***	6.188***	6.534***	5.388***	6.958***	6.689***
		(0.086)	(0.079)	(0.203)	(0.146)	(0.095)	(0.093)
Constant		16.688***	23.289***	17.516***	23.822***	16.503***	23.087***
		(0.076)	(0.078)	(0.192)	(0.142)	(0.084)	(0.092)
Country FE		No	Yes	No	Yes	No	Yes
Obs.		392,486	392,486	126,272	126,272	266,214	266,214
R2		0.164	0.874	0.105	0.878	0.176	0.870

Table A6: Cohort-specific variance in wealth (IWI) under observed and random mating scenarios, estimating wealth controlling for household characteristics

	Overall			Urban			Rural		
Marriage cohort	Variance (assortative)	Variance (random)	% ineq.	Variance (assortative)	Variance (random)	% ineq.	Variance (assortative)	Variance (random)	% ineq.
<1975	327.8	318.9	2.7%	604.4	581.4	3.8%	123.0	123.9	-0.7%
1975-1984	439.2	436.6	0.6%	683.1	648.5	5.1%	155.4	158.9	-2.3%
1985-1994	513.1	517.9	-0.9%	636.3	614.9	3.4%	220.3	226.2	-2.7%
1995-2004	584.1	577.9	1.1%	560.1	533.6	4.7%	271.4	272.7	-0.5%
>=2005	717.4	690.7	3.7%	474.9	453.9	4.4%	356.3	351.1	1.5%

Appendix Figures

Figure A1: Share of homogamous couples: both partners with the same educational level (top panel), both partners with no education (middle panel), both partners with higher education (bottom panel), by country (left) and region (right) of sub-Saharan Africa

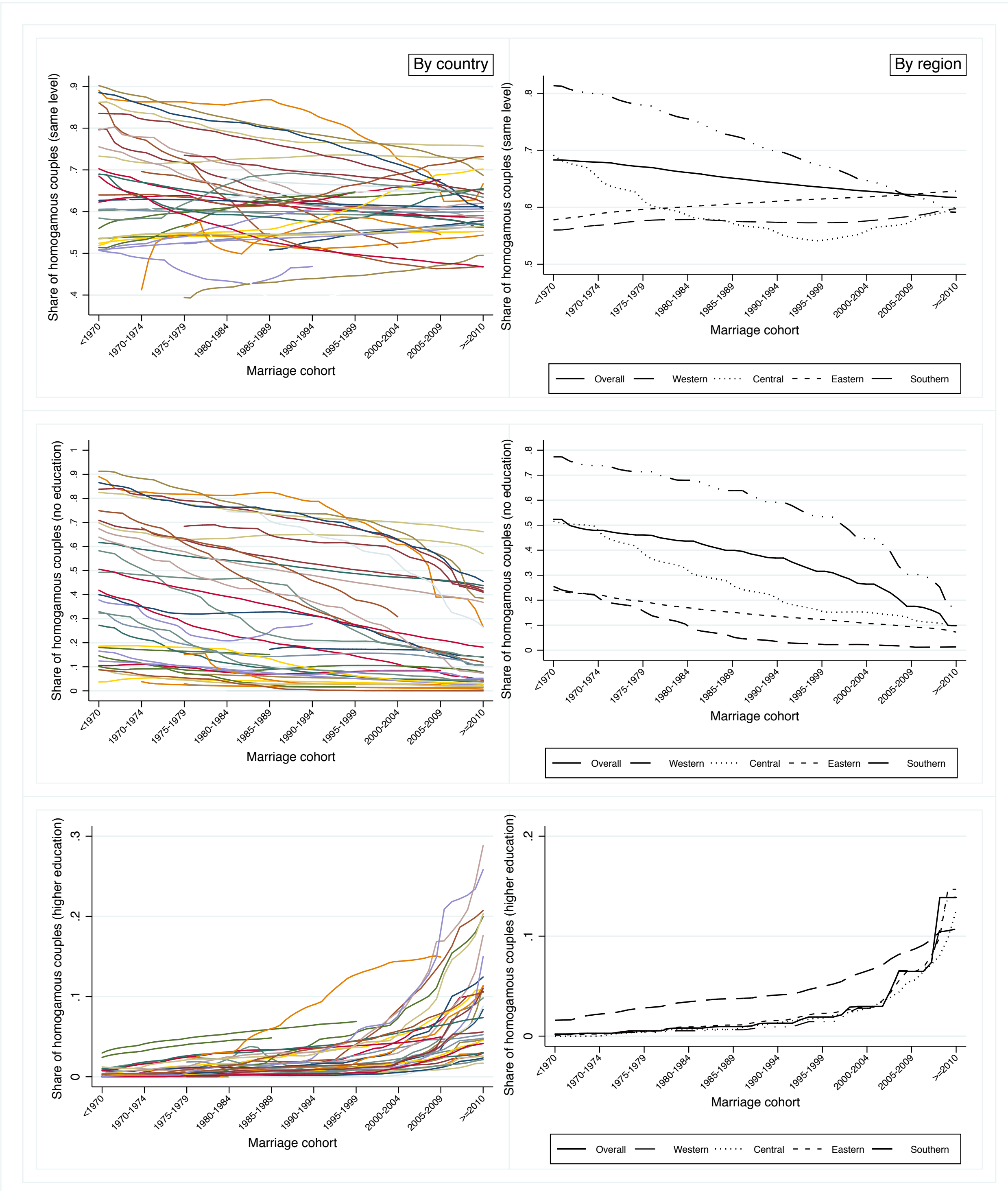


Figure A2: Positive educational assortative mating (s parameter), by region of sub-Saharan Africa and alternative age ranges of women: 15-49 (top), 20-35 (middle), and 30-45 (bottom)

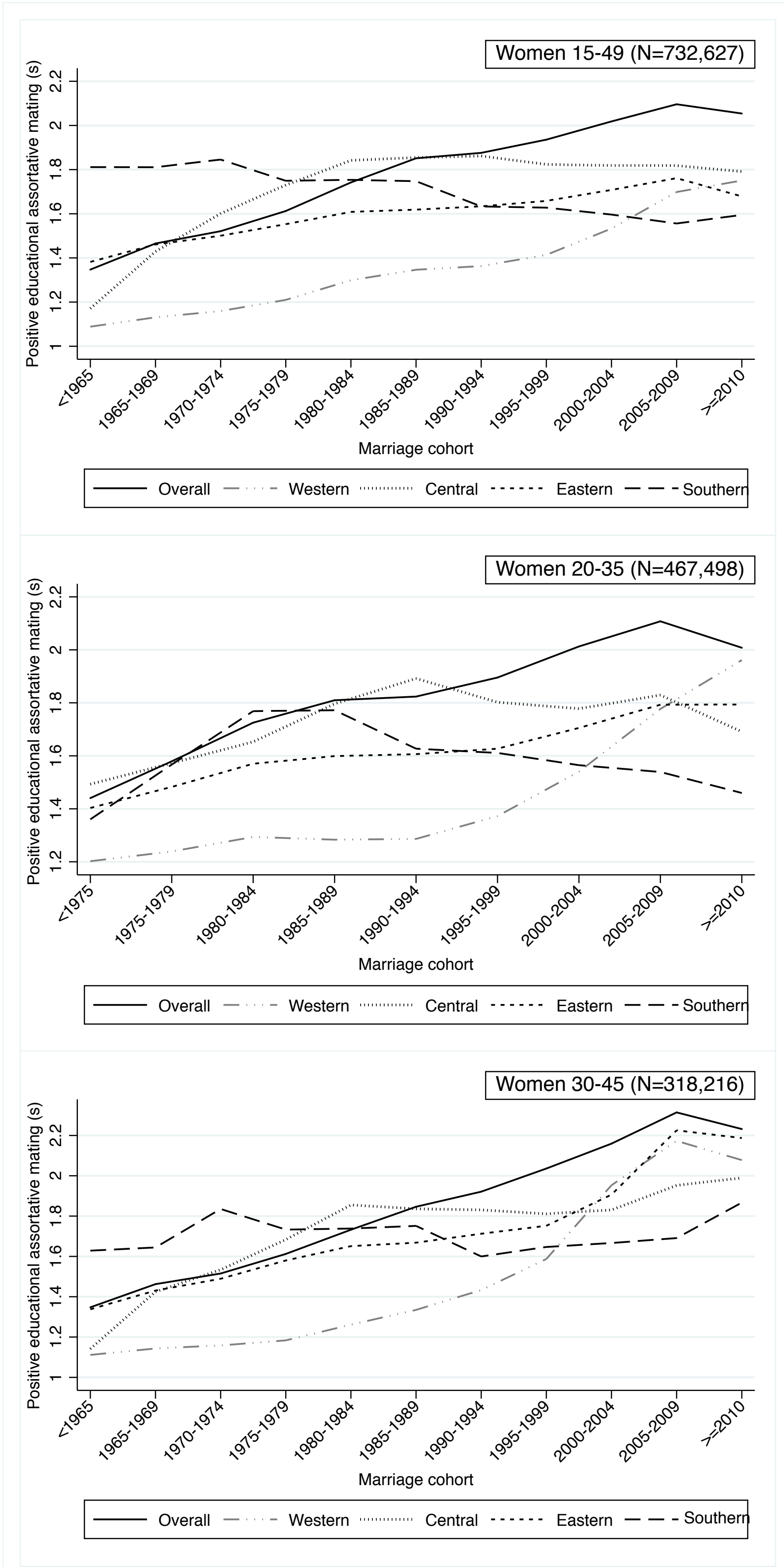
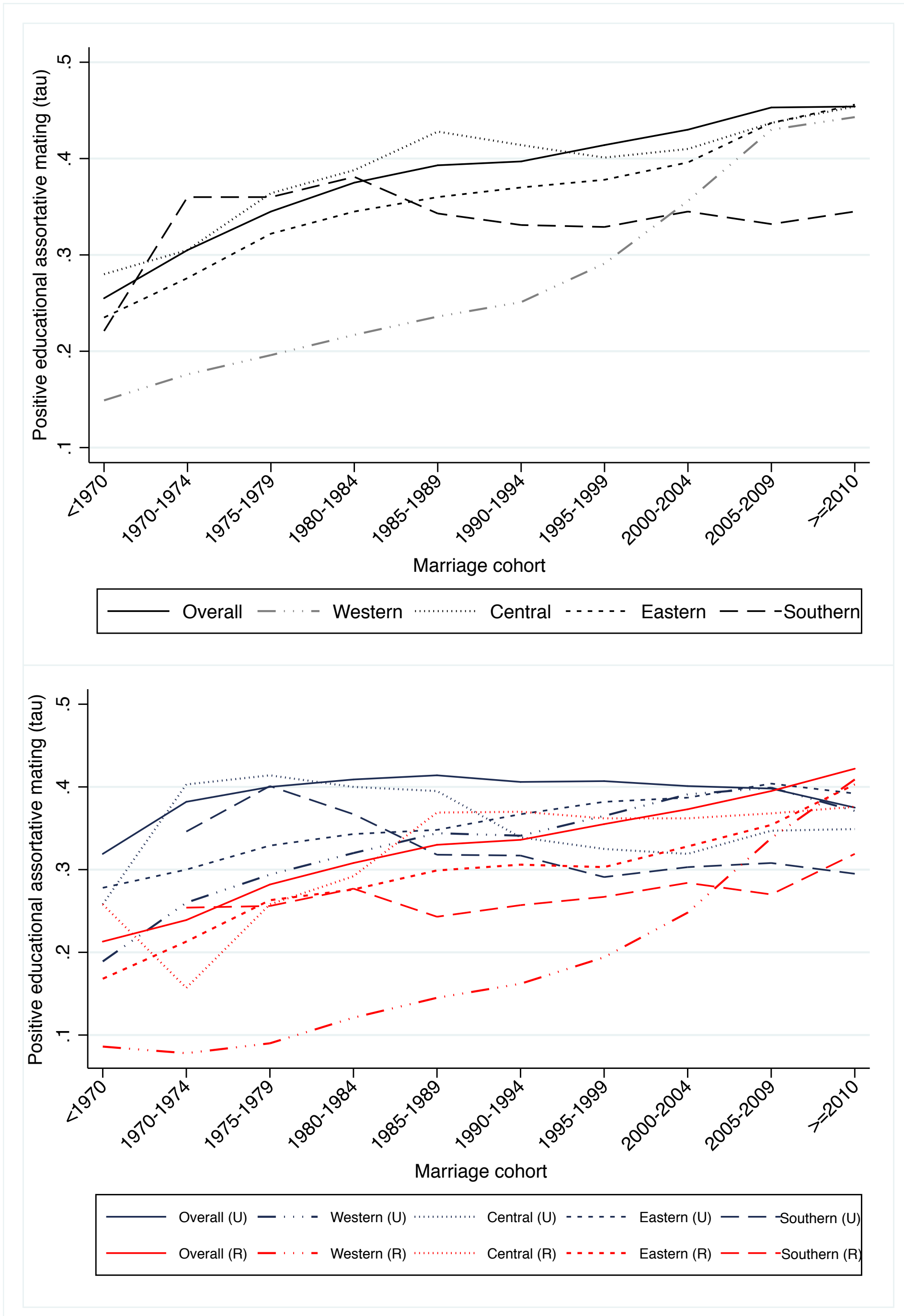


Figure A3: Positive educational assortative mating (τ parameter), by region of sub-Saharan Africa (top panel) and location of residence (bottom panel)



Notes: "U": urban; "R": rural.