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Female labour force participation in sub-Saharan Africa

A cohort analysis

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Abstract: Female labour force participation rates have stagnated in sub-Saharan Africa since the turn of the millennium. This paper aims to explain this aggregate pattern by decomposing it into the labour supply behaviour of different birth cohorts and age groups. Using representative and repeated census data from a heterogeneous sample of sub-Saharan African countries, we show that declining female labour supply at early working age is explained by increasing school attendance among young female cohorts. Taking this heterogeneity into account, we find a positive association between female labour force participation and female educational attainment across the working age. Female education is further positively related to female employment in the non-primary sector. Early motherhood, in turn, is associated with lower female schooling and a widening gender gap in labour supply. The higher investments in education by younger female cohorts, together with the demographics of sub-Saharan African countries, have implications for a potentially arising 'demographic dividend'.

Key words: labour supply, gender, sub-Saharan Africa, demographic dividend

JEL classification: J11, J16, J21, J24

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1 Introduction

The last few decades have seen considerable progress worldwide with regard to female access to education, health, and other factors generally considered as contributing to female empowerment. These factors are inclined to improve female outcomes in the labour market, both in terms of participation and in terms of the quality of work. However, recent trends in female labour supply in the developing world fell short of some of these expectations, as the female labour force participation rate (LFPR) has been stagnating or declining. Broadly speaking, this pattern can be seen in sub-Saharan Africa (SSA), where the aggregate female LFPR has hardly changed since the 1990s, remaining stagnant at slightly above 60 per cent (ILO 2021). At first sight, this pattern is puzzling, given the substantial gains in educational enrolment and attainment combined with declining fertility rates in SSA over the same period.

The literature that examines recent patterns in female labour force participation finds substantial regional heterogeneity across the developing world, but rather weak associations between female labour supply and correlates such as female education and fertility (Klasen 2019). On a more pessimistic note, Klasen (2020) highlights general stagnation and regression in several dimensions of gender equality, among them female labour force participation. Heath and Jayachandran (2017) review the existing evidence on female labour force participation more favourably, pointing to the positive impact of increased female enrolment in education. Klasen et al. (2020) also finds evidence for a positive association between female education and female LFPR in eight developing and emerging economies.

In this paper, we aim to clear up some of the confusion surrounding female labour supply in developing countries. We analyse female labour force participation in SSA from a demographic perspective using repeated census data for 15 SSA countries provided by the Minnesota Population Center (2019), in the following referred to as IPUMS International. We point out that the empirical patterns of and the associations between female labour supply, education, and fertility are heterogeneous regarding both the age and the birth cohort of the women in our sample. These sources of heterogeneity tend to be disguised by empirical specifications that use broad age aggregates and/or do not study differential cohort patterns.

We find that increasing school enrolment weakens the relationship between female labour force participation and educational attainment in early working life (ages 15–24) as higher enrolment in education reduces labour supply by withdrawing individuals from the labour force. During the prime working age (ages 25–44), education and female labour supply are then positively related. On top of this age-specific pattern, enrolment in education is substantially higher among the youngest female cohorts in our sample relative to the older ones, which additionally depresses female labour supply among the youngest cohorts at early working age.

We further find that in early working life, female labour force participation and fertility are positively related, as early motherhood is associated with lower enrolment in education. Thereafter, we do not find a significant relationship between female labour supply and fertility in prime working age. In turn, early motherhood is also strongly associated with a widening gender gap in labour supply between men and women in early working age, suggesting that early motherhood is detrimental to both female education and female labour supply. Younger female cohorts give birth for the first time at a later point in their lives than older cohorts, in line with their increased school attendance.

Regarding the quality of women's work, we find a robust association between female employment in the non-primary sector and female education. In contrast to the previously described associations, this pattern is stable across age groups and cohorts, suggesting a general benefit of education, while keeping in mind that employment in the tertiary sector in many SSA economies is not necessarily associated with more skilled labour supply.

Taken together, these results point to an important life-cycle perspective on female labour force participation in SSA: the youngest female cohorts sharply decrease their labour supply and increase their investment in education during early working life while simultaneously delaying the timing of their first births. The effects of these adjustments cannot be fully grasped yet, as they will unfold over the entire working lives of these cohorts, which we do not yet observe in the currently available data. However, the differential behaviour of these young cohorts does already and will continue to affect aggregate patterns due to the predominant demographic structure of SSA countries, where the youngest cohorts account for relatively large shares of the working-age populations: according to UN DESA (2019), 42 per cent of the SSA population was below age 15 in 2020, while the ten-year age interval 15–24 comprises 20 per cent of the population. We can presume that a large share of the adolescents in the latter age group is currently enrolled in secondary education and will enter the labour market in the next few years. Similar points regarding the demographic potential of the large and relatively well-educated young cohorts that are about to enter the labour markets of SSA economies are raised by Fox et al. (2016), albeit with a rather pessimistic view on the continuing importance of the informal sector and gendered transitions to employment due to early motherhood.

Our paper contributes to the literature on female employment trends across developing countries in general and across SSA in particular. In contrast to much of the existing literature, we focus on variation across cohorts instead of across periods. Among the few exceptions, cohort-centred perspectives are also adopted by Goldin and Mitchell (2017) and Mammen and Paxson (2000), who highlight changing patterns in female employment in the United States and in South Asian countries, respectively. Still, period-centred studies provide several points of reference for our approach: Verick (2014) notes that female LFPR are not only heterogeneous across regions, but also across age groups, with the school-age group showing falling labour supply due to higher school enrolment. He further points out that in regions with comparatively high female LFPR and small gender gaps in employment, such as SSA, the quality of female employment is an important dimension, as many women have to participate in the labour market due to poverty. Yeboah and Jayne (2018) use multiple data sources to study employment trends in nine SSA countries. Their focus is rather on sectoral employment trends out of agriculture, which they find to be accelerating, without a particular emphasis on female employment. While they analyse variation within age groups across time and not across cohorts, they note that rates of economic inactivity are high in the youngest age group (15–24), which they relate to extended periods of schooling, and that young adults leave farming jobs at a high rate once they have completed their education.

In a broader context, the cohort perspective on female labour force participation we take in this paper relates to the debate on the prospects of a 'demographic dividend' in SSA countries (Bloom et al. 2017; Groth and May 2017). Changes in the age composition of a population can have an effect on economic performance when the working-age population grows faster than the overall population (Bloom and Williamson 1998; Bloom et al. 2003). Our results indicate that the female working-age population in SSA is poised to change not only in relation to the total population but also in terms of its human capital, fertility, and the resulting labour supply, with this change being driven by the differential behaviour and experience of the cohorts currently of early working age. Assessments of a 'demographic dividend' in SSA and the potential contribution of the female workforce might therefore be premature at this point, as substantial gains in human capital are just about to be carried over into the labour market. The time lag between the acquisition of human capital via school attendance and the human capital fully coming into effect in the labour force is also noted by Goujon et al. (2016) and Kotschy et al. (2020).

The remainder of the paper is structured as follows: Section 2 describes the IPUMS International data, followed by a brief validation of our sample data against data from other sources. Section 3 outlines our empirical strategy. Section 4 presents our main results. Section 5 provides a discussion of the results and concludes with an outlook on the potential implications of the COVID-19 pandemic.

2 Data

2.1 Data source

Our approach requires detailed demographic data on female labour force participation in SSA and the related variables of interest, as we intend to differentiate the sampled individuals along their birth years. While the birth year can be computed at the aggregate level by subtracting the current age of a group from the given period, finer cohort sizes can be constructed and aggregated more flexibly from the birth years of individuals reported in micro data. By utilizing comprehensive micro data, we can also ascertain that all of our variables are aggregated from the same representative sample of individuals. However, given that we intend to use single cohorts instead of larger cohort groups, we further require rather large micro data sets in order to obtain representative cohort sizes.

Further, our intention is to compare different cohorts at the same age. This approach allows us to assess whether a younger cohort exhibits a different labour supply behaviour than an older cohort exhibited at the same age. Consequently, given that each cohort is observed once per sample period, we require at least two sample periods. These sample periods need to be sufficiently far apart from each other to allow differential cohort patterns to materialize but sufficiently close to each other to observe the same cohorts repeatedly during their working lives.

We rely on multiple waves of IPUMS International census extracts from SSA countries provided by the Minnesota Population Center (2019). We select census extracts from all those SSA countries for which at least two subsequent census waves are available since the late 1980s. This limits our analysis to 15 countries: Benin, Botswana, Burkina Faso, Ghana, Kenya, Lesotho, Malawi, Mali, Mozambique, Rwanda, Senegal, South Africa, Tanzania, Uganda, and Zambia. Some variables are not available for all countries in all census waves; for example, information on years of schooling is missing in the census data for Burkina Faso and Mozambique. The census waves are approximately ten years apart for most countries (see Table A2 in Appendix A for information on available census years for each country). Broadly speaking, the sample countries cover the various regions of SSA while also reflecting the large heterogeneity in economic development that can be found among SSA countries.

We select the cohorts for our analysis in five-year-intervals beginning at the turn of every decade of interest since 1970 (i.e. birth cohorts 1970, 1975, 1980, 1985, 1990, and 1995). We further allocate each cohort to one of three age groups in a given period: the age group 15–24 comprises cohorts of early working age, while the age groups 25–34 and 35–44 cover the prime working age. We do not study higher age groups, as most of our cohorts of interest do not reach these age groups during the sample period; older cohorts might further be affected by survival bias. Table 1 displays the total number of cohort observations that we obtain from all our sample countries and all periods for each age group. Unsurprisingly, observations of the youngest age group (15–24) are predominantly composed of the younger cohorts in our sample, as our sample period does not reach back far enough to observe the older cohorts at their early working age. Conversely, the observations of the two higher age groups are composed of relatively older cohorts, as we do not observe the youngest cohorts at these ages yet.

Table 1: Cohort observations by age group

Age groups	Cohort (birth year)					
	1970	1975	1980	1985	1990	1995
15–24	10	10	15	15	15	9
25–34	15	15	15	9	0	0
35–44	15	9	0	0	0	0

Source: authors' calculations.

From the IPUMS International micro data, we generate cohort averages of the female LFPR, the female school attendance rate, the female years of schooling, the number of children ever born to women of the respective cohort, the share of women who participate in the labour market and do not work in the primary sector, and the share of women among a female cohort who have at least one child. Importantly, school attendance and enrolment rates comprise enrolment in primary, secondary, and post-secondary education in our context. School attendance rates and LFPR further do not necessarily add up to 100 per cent, as a number of women simultaneously attend school and participate in the labour market in many of our sample countries. We present cohort averages of our main variables by age group aggregated across all sample countries in Table A1 in Appendix A.

Our focus on female LFPR warrants a digression into the topic of measuring labour force participation in general and female labour force participation in particular in the SSA context. Unsurprisingly, the definition of when an individual is participating in the labour market differs across countries and potentially also across census waves. The IPUMS data harmonize these definitions by simplifying them to a binary indicator for labour force participation which is primarily derived from the recorded employment status. However, this simplification cannot take into account that some countries, for example, define employment based on the individual labour supply in the most recent week, while others define it according to the labour supplied in the most recent month. If these differences can be assumed to be constant within countries across census waves, country fixed effects (FE) can be a straight-forward way to address this problem.

While the dichotomization of the labour force participation nexus provides us with a basic data framework for our analysis, it obscures several relevant nuances. For example, it does not differentiate whether the individual is participating in the formal or in the informal labour market of the economy. Access to the formal sector is often gender-specific if the informal sector is large, which is the case in many SSA countries (Vanek et al. 2014). Another gender-specific issue is that the IPUMS International data categorize individuals who mainly provide domestic work neither as participating nor as not participating in the labour force. Hence, domestic workers, many of them women, do not enter the calculation of the female LFPR, while their domestic labour supply might be high. An issue in the SSA context is that the distinction between domestic work that is not recorded as formal labour force participation and work that is essentially domestic but potentially recorded as formal labour force participation in the primary or tertiary sector is not always clear-cut. This applies to sporadic hours of labour spent on a self-owned micro-enterprise or on the household's agricultural plot, for example. Finlay et al. (2019) provide more in-depth qualitative evidence on how to measure women's work in SSA countries. On a related note, the IPUMS data do not allow us to study the intensive margin of labour supply, as information on the hours worked is unavailable. However, McCullough (2017) shows that the hours worked differ substantially between the agricultural and the non-agricultural sectors in four African economies. Van den Broeck and Kilic (2019) further shed light on gender-specific patterns in off-farm employment in five SSA countries, pointing out that important shifts from farm to wage- or self-employment can take place entirely within the primary sector.

2.2 Data validation

We briefly validate our sample of the IPUMS International data by comparing our main variables to the data provided by other secondary sources, primarily the World Bank's World Development Indicators (WDI) and the ILO's ILOSTAT database. We extract female LFPR and female secondary-school enrolment rates from the respective databases and match them to the countries and periods in our IPUMS International sample.

Figure 1 provides scatter plots of the main variables for the SSA sample countries as computed from the IPUMS International data against the ILO and WDI data, respectively. As shown in the two top panels and the mid-left panel, the female LFPR computed from the IPUMS International data and extracted from ILOSTAT are positively correlated, as indicated by the upward-sloping linear fits. The correlation becomes stronger if only the female age group 15–24 is considered and if national estimates from the ILOSTAT database instead of the ILO modelled estimates are used. The mid-right and the two bottom panels further show scatter plots of the IPUMS International data on female school attendance rates at age 15–24, female years of schooling, and female fertility against related variables from the WDI. All three plots indicate a positive and strong correlation between the respective variables from the two data sources.

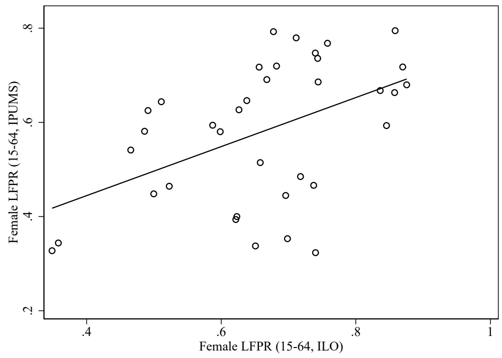
3 Empirical strategy

Our empirical strategy relies on the panel structure of our data, which allows us to differentiate between age and cohort effects on female labour force participation, while simultaneously letting the associations between female labour force participation and its correlates vary by age and cohort. Age and cohort effects cannot be differentiated within a single cross-section of data, as the two effects are collinear in this context. In the panel data context, both effects are identified, while additional period effects can generally not be identified without imposing additional constraints.

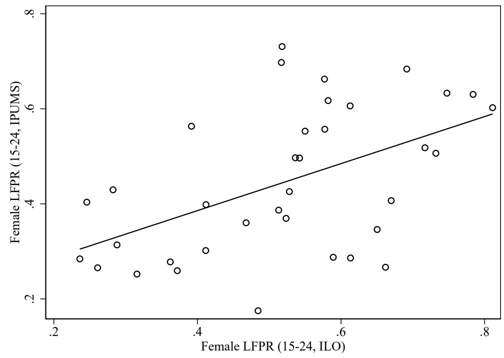
While including age effects in the regression model for allowing heterogeneity across the life cycle is rather standard, our approach of further including cohort instead of period effects warrants a more thorough explanation: Period effects result from external factors that equally affect all age groups at a particular point in time. Cohort effects, by contrast, are variations resulting from the unique experience or exposure of a group of subjects (i.e. the members of the same birth cohort) as they move across time (Keyes et al. 2010). Our interpretation of the available data is that the main factors that have been driving female LFPR in SSA in recent periods are to be found in the behaviour of the youngest female cohorts at working age. More specifically, these youngest cohorts have been presented with substantially broader access to secondary and post-secondary education than the previous cohorts have. While the broadened access to education already affects the labour supply of the youngest cohorts during their early working lives, their cohort-specific exposure to education will continue to influence their labour supply behaviour over their future life course. Consequently, we prefer to model the female LFPR that we observe during our sample period as being explained by cohort- rather than period-specific effects.

Figure 1: Comparisons of female LFPR from IPUMS and ILO

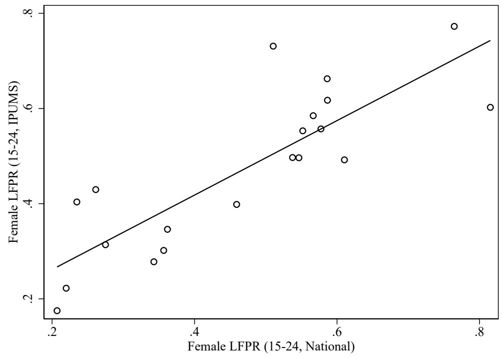
(a) Female LFPR 15–64 from IPUMS and ILO



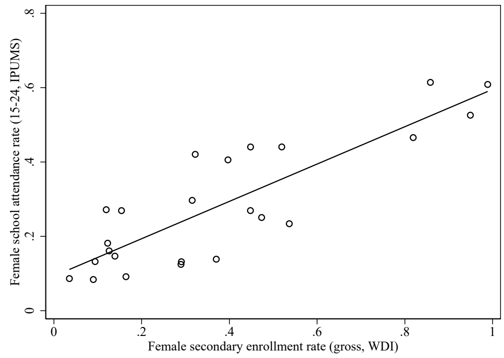
(b) Female LFPR 15–24 from IPUMS and ILO



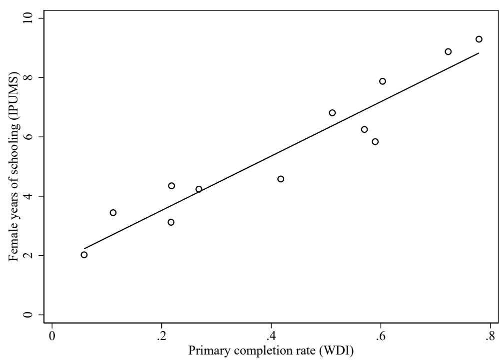
(c) Female LFPR from IPUMS and ILO



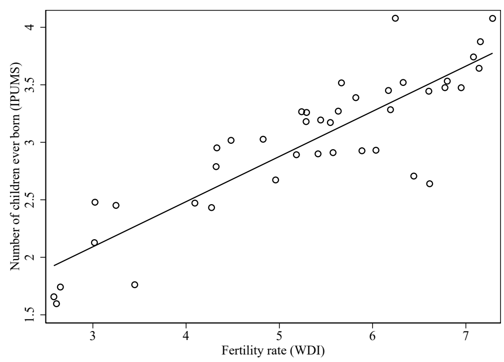
(d) Female enrolment from IPUMS and WDI



(e) Female education from IPUMS and WDI



(f) Female fertility from IPUMS and WDI



Note: the upper-left panel shows a scatter plot of female LFPR at age 15–64 from IPUMS and ILO for the SSA sample countries and years. The upper-right panel shows a scatter plot of female LFPR at age 15–24 from IPUMS and ILO for the SSA sample countries and years. The mid-left panel shows a scatter plot of female LFPR at age 15–24 from IPUMS and national estimates from ILO for the SSA sample countries and years. The mid-right panel shows a scatter plot of female school attendance rates at age 15–24 from IPUMS and female secondary enrolment rates from WDI for the SSA sample countries and years. The lower-left panel shows a scatter plot of female years of schooling from IPUMS and the share of women who have completed primary education from WDI for the SSA sample countries and years. The lower-right panel shows a scatter plot of the number of children ever born to women at age 15–64 from IPUMS and the total fertility rate from WDI for the SSA sample countries and years.

Source: authors' construction based on data from IPUMS, ILO, and WDI..

Our main empirical specification is a linear regression model that reads as follows:

$$Female\,LFPR_{it} = \beta x_{it} + \theta_i + \mu_t + \varepsilon_{it} \tag{1}$$

where $Female\,LFPR_{it}$ is the female LFPR of cohort $t = \{1970, 1975, 1980, 1985, 1990, 1995\}$ in group i. Groups are defined at the country–age group level, with the group FE θ_i absorbing time-constant group-level heterogeneity. Hence, this specification controls for country-specific age profiles in female labour supply. The cohort FE μ_t, in turn, absorb shocks that are common to all groups born in the same year in all sample countries. The parameter β reflects the association between the female LFPR and time-varying covariates such as education or fertility. We will further allow β to vary across age groups and cohorts by interacting it with binary age group and cohort indicators, respectively. ε_{it} is an unobserved error term.

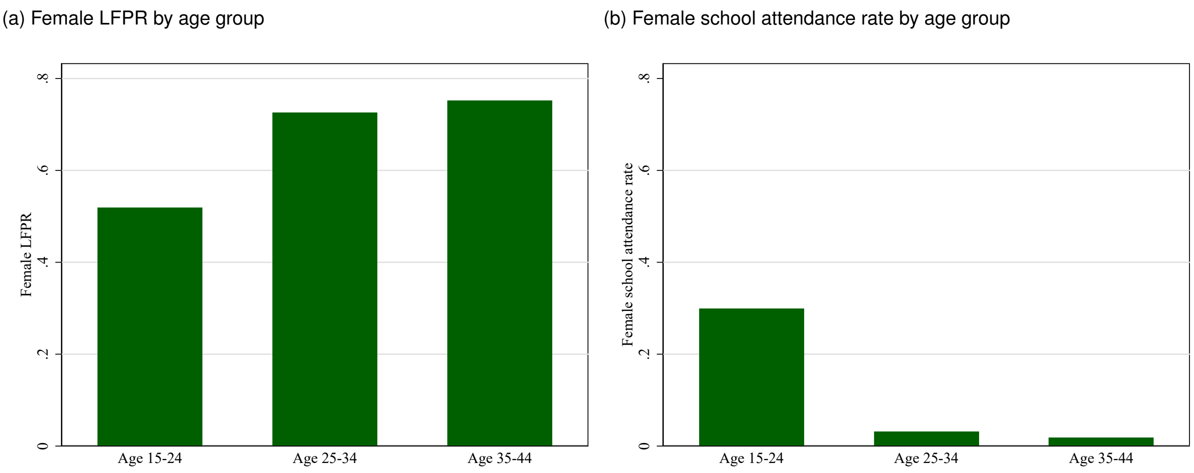
4 Results

4.1 Female labour supply and education

Both enrolment in education and educational attainment have substantially increased in SSA over the past decades. According to Evans and Mendez Acosta (2021), the median primary completion rate in SSA countries soared from about 40 per cent to 70 per cent between 1995 to 2015. Simultaneously, the median lower secondary completion rate has doubled from 20 per cent to 40 per cent. These trends suggest that younger cohorts in SSA have been spending more time in education than older ones.

Regarding the association between enrolment in education and participation in the labour market, Figure 2 presents an intuitive aggregate pattern: Female labour supply and female enrolment in education (any education level) are inversely related. Pooling all countries and cohorts, the female LFPR increases markedly by about 20 percentage points (pp) when moving from the youngest age group (15–24) to the age group 25–34. From there, it essentially plateaus, showing only a marginal increase when moving to the age group 35–44. The female school attendance rate, in turn, falls by more than 20 pp between age groups 15–24 and 25–34, showing an additional small decrease when moving to age group 35–44.

Figure 2: Female LFP and school attendance rates by age group

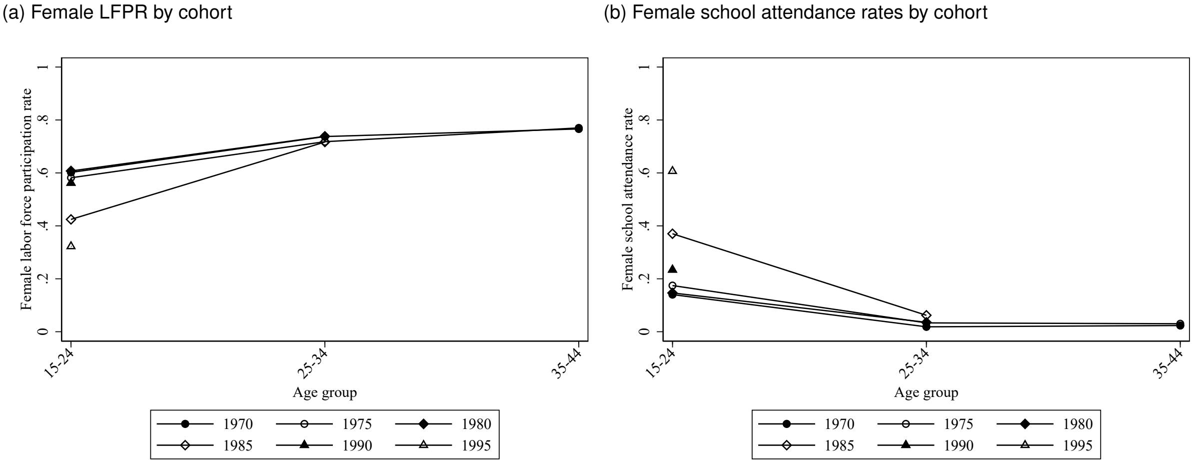


Note: the left panel shows female LFPR averaged across the SSA sample countries and differentiated by three age groups. The right panel shows female school attendance rates averaged across the SSA countries and differentiated by three age groups.

Source: authors' construction based on data from IPUMS.

Figure 3 displays again the evolution of female labour supply and female enrolment in education, respectively, across age groups, but differentiates the patterns by cohorts. At prime working age, the female LFPR and school attendance rates are virtually identical for all cohorts. However, the cohorts are much more heterogeneous in the youngest age group (15–24): the later a cohort was born, the lower is its labour supply and the higher is its enrolment in education. Only the cohorts born in 1985 and 1990 pose a minor exception to this pattern. A caveat to keep in mind here is that the cohorts born in 1970, 1975, and 1995 in this age group are constructed from a smaller number of countries than the cohorts born in 1980, 1985, and 1990, respectively.

Figure 3: Female LFP and school attendance rates by cohort



Note: the left panel shows female LFPR averaged across the SSA sample countries by cohort and across three age groups. The right panel shows female LFPR averaged across the SSA sample countries by cohort and across three age groups. Each marker represents one cohort observation; each line connects observations from the same cohort.

Source: authors' construction based on data from IPUMS.

In order to highlight the mechanistic character of the negative association between enrolment in education and participation in the labour force during early working life, we regress the female LFPR on the female school attendance rate while restricting the sample to the age group 15–24. As shown in column 1 of Table 2, the female LFPR and the female school attendance rate are strongly negatively related in this age group, suggesting a significant decline in the female LFPR by 0.63 pp for a 1 pp increase in the female school attendance rate. The strength of the correlation increases slightly once we add cohort FE to the regression (column 2). Notably, the cohort FE are all insignificant and small in magnitude, suggesting that the labour supply in this age group is stable across cohorts once controlling for the school attendance. We further interact the female school attendance rate with the cohort FE (column 3). However, all interaction terms are statistically insignificant, providing no reason to suspect that the negative association between school attendance and labour supply in early working life is driven by one or several particular cohorts.

Keeping this result in mind, we next focus on the association between female labour supply and female educational attainment using our full sample. In Figure 4, we exemplify the age-specific heterogeneity in the association between female LFPR and female education. Pooling all age groups together to exploit only the variation across countries and census waves in the sample, the left panel indicates a positive but rather weak association between female education and female LFPR. Differentiating the observations by age groups reveals an important heterogeneity though: in the right panel, the association between female education and female LFPR is negative for the age group 15–24, while it is positive and stronger than in the pooled plot for the two older age groups. The negative association for the age group 15–24 is easily explained by a positive correlation of female years of schooling with female school attendance: young women who accumulate more years of schooling remain enrolled in education longer and more frequently; hence they supply less labour than young women of the same age who are not enrolled in education. At prime working age, then, the positive associations indicate a return to education in terms of higher female LFPR.

Table 2: Female LFPR and female school attendance rates at age 15–24

	(1)	(2)	(3)
School attendance rate	–0.628***	–0.662***	–0.791***
	(0.04)	(0.05)	(0.22)
Year of birth = 1975		0.047	0.038
		(0.04)	(0.06)
Year of birth = 1980		0.064	0.015
		(0.04)	(0.07)
Year of birth = 1985		0.027	0.029
		(0.03)	(0.06)
Year of birth = 1990		0.060	0.031
		(0.04)	(0.07)
Year of birth = 1995		0.087	0.088
		(0.05)	(0.12)
Year of birth = 1975 × school attendance rate			0.115
			(0.24)
Year of birth = 1980 × school attendance rate			0.328
			(0.24)
Year of birth = 1985 × school attendance rate			0.074
			(0.23)
Year of birth = 1990 × school attendance rate			0.185
			(0.26)
Year of birth = 1995 × school attendance rate			0.093
			(0.26)
Observations	70	70	70
Country FE	Yes	Yes	Yes

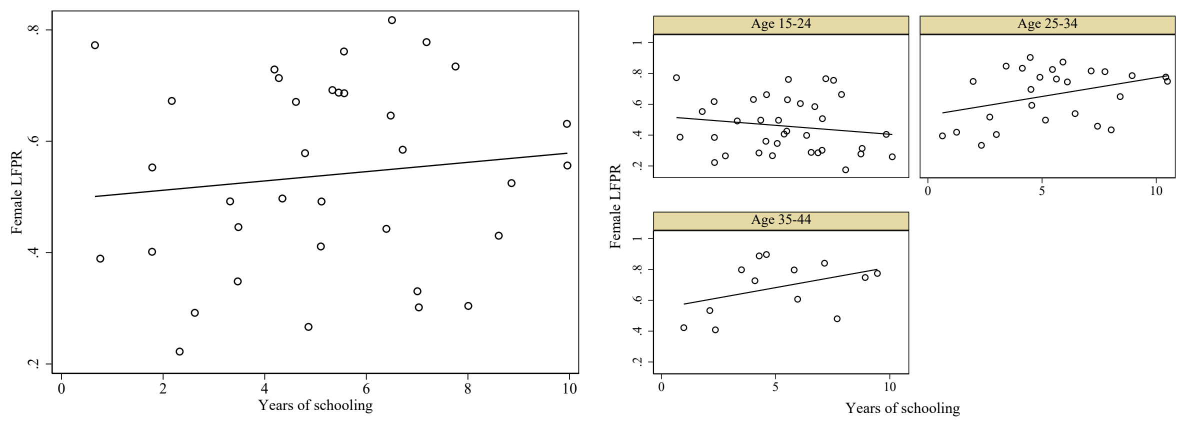
Note: the table reports results from linear regressions of the female LFPR at age 15–24 on the female school attendance rate at the same age. The baseline result is reported in column 1. Cohort FE are added to the regression reported in column 2. Interactions of the cohort FE with the female school attendance rate are added to the regression reported in column 3. Country FE is included in all regressions. Robust standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: authors' calculations based on data from IPUMS.

Figure 4: Female LFPR and education

(a) Female LFPR and education, pooled

(b) Female LFPR and education by age group



Note: the left panel shows a scatter plot of female LFPR against the female years of schooling in the SSA sample countries and census waves. The right panel shows scatter plots of female LFPR against female years of schooling in the SSA sample countries and census waves differentiated by three age groups.

Source: authors' construction based on data from IPUMS.

Turning to the regression analysis on the full sample, Column 1 of Table 3 shows that regressing the female LFPR on the female years of schooling while controlling only for the country-specific age profiles in female labour supply yields a small, positive, and insignificant coefficient. The magnitude and significance of the coefficient are unaffected once we interact the years of schooling with the two indicators for the age groups 25–34 and 35–44, respectively (column 2). The interaction effects are insignificant, suggesting that the association between the female LFPR and the female years of schooling does not vary across the age groups. Finally, we add the cohort FE to the regression in order to capture the higher absence of the youngest female cohorts from the labour market due to increased school enrolment (column 3). Indeed, the coefficients of the cohort FE suggest that the LFPR of every female cohort in our sample born after 1970 is lower than the LFPR of the 1970 cohort. The cohort FE are particularly large and highly significant for the three cohorts born in 1985, 1990, and 1995, respectively, who predominantly fall into the age group 15–24 during our sample period. Hence, the cohort FE absorb the heterogeneity between cohorts induced by the higher school attendance rates of the youngest cohorts. As a result, the coefficient for the female years of education is now positive and highly significant, implying that one more year of education is on average associated with a 14 pp higher female LFPR. The interactions of the years of schooling with the age groups remain insignificant, indicating that the association between female schooling and female labour supply is constant during working age once the differential cohort behaviour in the youngest age segment has been accounted for.

Table 3: Female LFPR and female years of schooling

	(1)	(2)	(3)
Years of schooling	0.018	0.019	0.142***
	(0.02)	(0.03)	(0.02)
Age 25–34 × years of schooling		–0.004	–0.034
		(0.03)	(0.03)
Age 35–44 × years of schooling		–0.015	–0.048
		(0.03)	(0.04)
Year of birth = 1975			–0.059*
			(0.03)
Year of birth = 1980			–0.071
			(0.04)
Year of birth = 1985			–0.225***
			(0.05)
Year of birth = 1990			–0.325***
			(0.05)
Year of birth = 1995			–0.501***
			(0.06)
Observations	130	130	130
No. clusters	35	35	35
Country FE	Yes	Yes	Yes
Age group FE	Yes	Yes	Yes
Country × age group FE	Yes	Yes	Yes

Note: the table reports results from linear regressions of the female LFPR on female years of schooling. The baseline result is reported in column 1. Column 2 additionally reports estimates of interaction effects of the female years of schooling with the age groups. Column 3 reports results from adding cohort FE to the regression. Country–age group FE included in all regressions. Robust standard errors clustered at the country–age group level reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: authors' calculations based on data from IPUMS.

These results are consistent with a variety of studies that use individual-level data from SSA countries to study the education–employment relationship, including those that evaluate the causal effects of (quasi-)experimental interventions in education on economic outcomes. Using Ghanaian data from the late 1990s, Sackey (2005) finds a positive association between female educational attainment and female participation in the labour market. Abekah-Nkrumah et al. (2019) find some evidence that an exogenous increase in the duration of high school education in Ghana significantly increases the female employment rate, while male employment rates remain unaffected. Again in the Ghanaian context, Duflo et al. (2019) conduct a randomized controlled trial (RCT) of scholarships for secondary-school attendance. They find that the female scholarship recipients are more likely to work in the public sector than non-recipients, while the self-employed among the female recipients are more likely to be involved in a more formal enterprise instead of petty trade or services than non-recipients. In a broader sense, our results are also consistent with the evaluation of an RCT-type female empowerment programme in Uganda by Bandiera et al. (2020), who find that providing entrepreneurial human capital to adolescent women raises the probability that the latter engage in skilled self-employment.

4.2 Female labour supply and fertility

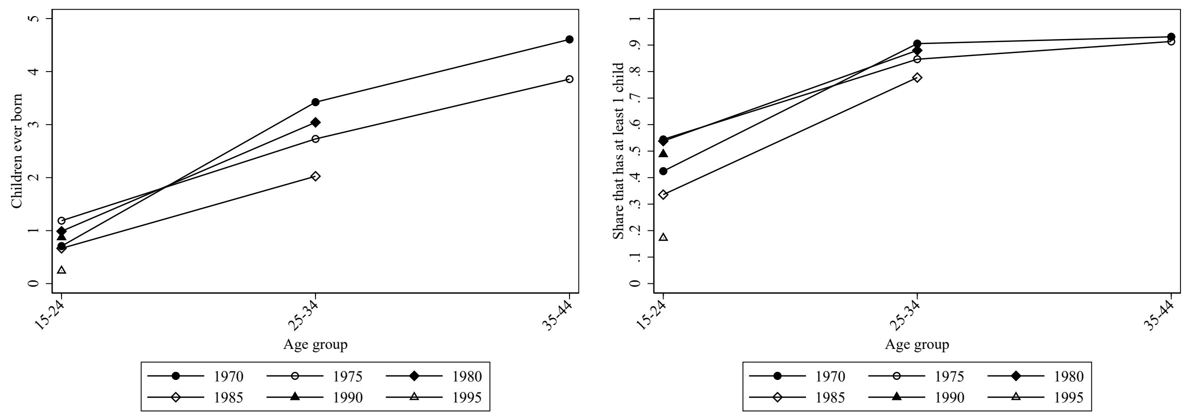
Fertility has generally been falling across SSA in the past two decades (Tabutin et al. 2020), albeit at different rates between countries (Schoumaker 2019). This tendency is reflected in the left panel of Figure 5: the absolute decline in fertility, measured in terms of the number of children ever born, is particularly pronounced in the age group 25–34. Within the youngest age group 15–24, the absolute changes between cohorts are smaller and hence harder to distinguish. The cohort born in 1995 exhibits a strong decline in fertility in this age group, keeping in mind again that this cohort average is not constructed from all sample countries.

In addition to the number of children, which is rather a measure of the intensive margin of fertility, we also consider the onset of motherhood as an extensive margin measure of fertility. For this purpose, we compute the share of women who have at least one child in a given cohort at a given age. The right panel of Figure 5 suggests that this share has only been slightly declining across cohorts within each of the two higher age groups: the large majority of women in our sample become mothers between age 25 and 34, irrespective of their cohort. Within the youngest age group, however, the share of women who are already mothers falls markedly in the cohorts born in 1985 and 1995.

Figure 5: Children ever born and share of mothers by cohort

(a) Children born by cohort

(b) Share of mothers by cohort



Note: the left panel shows the average number of children ever born to women in the SSA sample countries by cohort and across three age groups. The right panel shows the average share of women who have at least one child in the SSA sample countries by cohort and across three age groups. Each marker represents one cohort observation, each line connects observations from the same cohort.

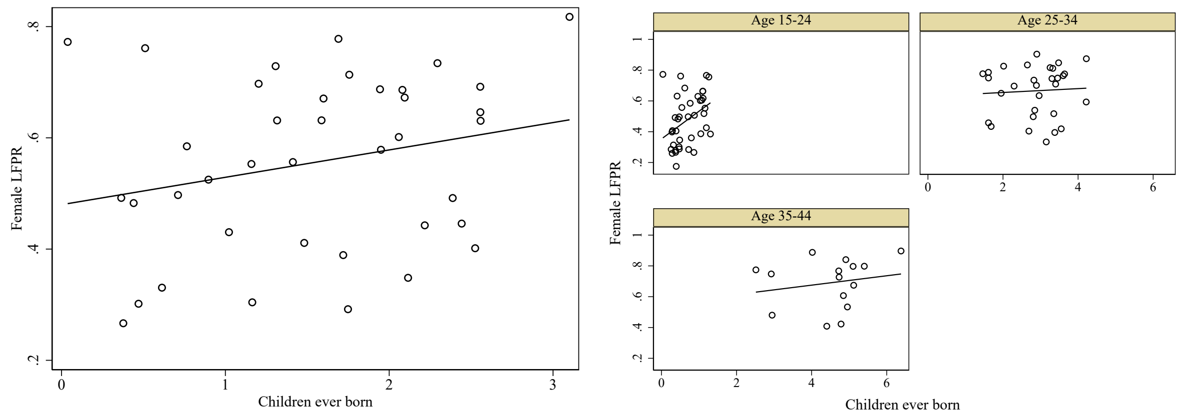
Source: authors' construction based on data from IPUMS.

Klasen (2019) suggests that falling fertility might free up time resources for women to participate in the labour market. However, he does not find evidence to support this notion when correlating female LFPR (ages 15–64) with fertility rates across world regions. We replicate these correlations for our sample of SSA countries but differentiate the data by age group. Pooling all age groups together, the left panel of Figure 6 indicates a positive association between the female LFPR and the average number of children ever born. However, once we differentiate the correlations by the three age groups, as shown in the right panel of Figure 6, it becomes apparent that the positive association is almost entirely driven by the age group 15–24. For the two older age groups, the association between female labour supply and female fertility is only weakly positive.

Figure 6: Female LFPR and fertility

(a) Female LFPR and fertility, pooled

(b) Female LFPR and fertility by age group

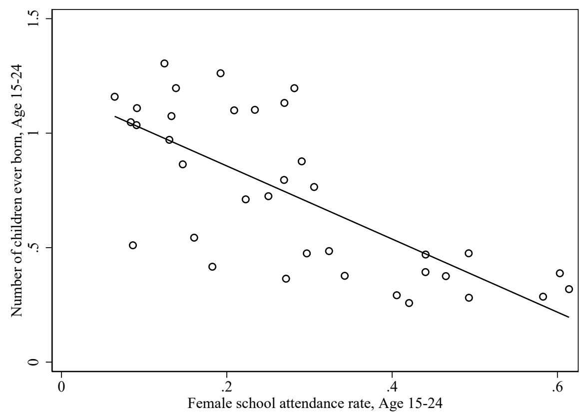


Note: the left panel shows a scatter plot of female LFPR against the number of children ever born to women in the SSA sample countries and census waves. The right panel shows scatter plots of female LFPR against the number of children ever born to women in the SSA sample countries and census waves differentiated by three age groups.

Source: authors' construction based on data from IPUMS.

We further investigate the positive correlation between female labour supply and fertility within the age group 15–24. We suspect that the women in this young age group who already have children are less likely to attend school than the women in the same age group who are not mothers yet. Figure 7 provides evidence in this regard, as the school attendance rate and the number of children ever born are strongly negatively associated in this age group. In turn, early motherhood might then increase early female labour supply in a similarly mechanistic way that female school attendance has been shown to decrease it.

Figure 7: Fertility and female school attendance in age group 15–24



Note: the graph shows a scatter plot of the average number of children ever born to women against female school attendance rates in the age group 15–24 in the SSA sample countries and census waves.

Source: authors' construction based on data from IPUMS.

This intuition is confirmed by the regression results presented in Table 4. Regressing the female LFPR on the number of children ever born by women in the age group 15–24 yields a positive and highly significant coefficient (column 1). However, both magnitude and significance disappear once we control for the female school attendance rate, which is strongly negatively related to the female LFPR (column 2). This pattern is unaffected by cohort FE, which we add to the regression reported in column 3.

Table 4: Female LFPR and fertility at age 15–24

	(1)	(2)	(3)
Children ever born	0.173***	0.014	0.012
	(0.03)	(0.02)	(0.03)
School attendance rate		–0.605***	–0.635***
		(0.06)	(0.08)
Year of birth = 1975			0.040
			(0.04)
Year of birth = 1980			0.058
			(0.04)
Year of birth = 1985			0.018
			(0.04)
Year of birth = 1990			0.053
			(0.04)
Year of birth = 1995			0.076
			(0.06)
Observations	69	69	69
Country FE	Yes	Yes	Yes

Note: the table reports the results from linear regressions of the female LFPR at age 15—24 on the number of children ever born at age 15–24. The baseline result is reported in column 1. The female school attendance rate at age 15–24 is added to the regression reported in column 2. Cohort FE are added to the regression reported in column 3. Country FE is included in all regressions. Robust standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: authors' calculations based on data from IPUMS.

Hence, we find support for the notion that the channel through which fertility in this young age group increases female labour supply is that early motherhood is associated with lower school attendance, which in turn is associated with higher labour supply within this age group. We can further replicate this pattern using the share of women with at least one child instead of the number of children ever born. We relegate the corresponding Table A3 to Appendix A.

The negative association between female enrolment in education and early female fertility is consistent with micro-level studies from a variety of SSA countries that present causal evidence regarding the negative impact of early female education on early female fertility (Duflo et al. 2015; Keats 2018; Osili and Long 2008; Ozier 2018). Herrera et al. (2019) provide complementary evidence that first births occurring during adolescence increase the probability of employment, which is partially mediated through school dropout, with the quality of employment being low.

We now focus on the association between female labour supply and fertility in the full sample. In column 1 of Table 5, we present results from regressing the female LFPR on the number of children ever born while controlling only for the country–age-specific age patterns in labour supply. The association is positive and highly significant, implying that increasing fertility by one child is associated with a higher female LFPR of 8.8 pp on average. Interacting the number of children with the indicators for the age groups 25–34 and 35–44 reveals a pronounced heterogeneity: as shown in column 2, the baseline association for the age group 15–24 becomes even stronger, now indicating that increasing the number of children ever born to women in this age group by one is associated with an average increase in the female LFPR by 15.3 pp. However, the coefficients of the interaction terms are of similar absolute magnitude, negative, and highly significant. F-tests cannot reject the null hypothesis that the sum of the baseline coefficient and the respective interaction effects is not statistically different from zero. These results essentially confirm the visual inspections of the associations shown above. The cohorts do not induce additional heterogeneity, as shown in column 3, as the cohort FE are small and insignificant, with the exception of the effects for the 1985 and 1995 cohorts being weakly significant.

Table 5: Female LFPR and fertility

	(1)	(2)	(3)
Children ever born	0.088***	0.153***	0.129***
	(0.02)	(0.03)	(0.03)
Age 25–34 × children ever born		–0.128***	–0.133***
		(0.03)	(0.03)
Age 35–44 × children ever born		–0.146***	–0.170***
		(0.03)	(0.04)
Year of birth = 1975			–0.034
			(0.02)
Year of birth = 1980			0.001
			(0.03)
Year of birth = 1985			–0.086*
			(0.04)
Year of birth = 1990			–0.039
			(0.04)
Year of birth = 1995			–0.162*
			(0.07)
Observations	145	145	145
No. clusters	39	39	39
Country FE	Yes	Yes	Yes
Age group FE	Yes	Yes	Yes
Country × age group FE	Yes	Yes	Yes

Note: the table reports results from linear regressions of the female LFPR on the number of children ever born. Column 1 reports the baseline result. Column 2 additionally reports estimates of interaction terms of the number of children with the age groups. Column 3 reports results from adding cohort FE to the regression. Country–age group FE are included in all regressions. Robust standard errors clustered at the country–age group level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: authors' calculations based on data from IPUMS.

Taken together, we find that in prime working age, fertility only weakly correlates with female labour supply, corresponding to the result of Klasen (2019). In early working age (15–24), surprisingly, female LFPR and fertility are positively related. Our findings suggest that young women face a trade-off between fertility and education rather than between fertility and labour supply. While fertility has generally decreased and enrolment has increased in the age group 15–24, the women who become mothers at this young age still appear to face a greater risk of dropping out of education, which in turn increases their labour supply. In turn, the resources that the fertility decline has potentially freed up for young women seem to flow into education instead of the labour market.

4.3 Female labour supply outside of agriculture

We further consider a measure of the quality of female labour supply: the share of women employed in the non-primary sector among all women employed. Averaging across all countries, cohorts, and age groups in our sample, this share amounts to 44 per cent, which is only slightly lower than the share of men employed in the non-primary sector among all employed men. The female share is roughly in accordance with the estimates provided by Palacios-Lopez et al. (2017).

In column 1 of Table 6, we regress this share on the female years of schooling. The coefficients indicate that one additional year of schooling is on average and significantly related to a 6 pp higher female employment rate in the non-primary sector. This association is stable during the early and prime working age, as suggested by the small and insignificant interaction term effects between age groups and schooling reported in column 2. The magnitude of the schooling coefficient is further only slightly decreased by the addition of the cohort FE to the regression, which all turn out to be insignificant (column 3).

Table 6: Female employment in the non-primary sector

	(1)	(2)	(3)
Years of schooling	0.059***	0.056**	0.045**
	(0.01)	(0.02)	(0.02)
Age 25–34 × years of schooling		0.017	0.008
		(0.03)	(0.03)
Age 35–44 × years of schooling		–0.005	–0.015
		(0.02)	(0.03)
Year of birth = 1975			0.016
			(0.02)
Year of birth = 1980			0.034
			(0.03)
Year of birth = 1985			0.036
			(0.03)
Year of birth = 1990			0.067
			(0.05)
Year of birth = 1995			0.051
			(0.06)
Observations	100	100	100
No. clusters	31	31	31
Country FE	Yes	Yes	Yes
Age group FE	Yes	Yes	Yes
Country × age group FE	Yes	Yes	Yes

Note: the table reports results from linear regressions of the share of women employed in the non-primary sector among all employed women on the female years of schooling. Column 1 reports the baseline result. Column 2 additionally reports estimates of interaction effects of the female years of schooling with the age groups. Column 3 reports results from adding cohort FE to the regression. Country–age group FE are included in all regressions. Robust standard errors clustered at the country–age group level are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: authors' calculations based on data from IPUMS.

Hence, we find a strong association between higher female educational attainment and higher female employment shares outside of agriculture that is constant across the life cycle. While our previous results showed that education and labour supply are negatively related in the youngest age group, education is potentially as useful to young women who already work for finding employment in the non-primary sector as it is for women in the older two age groups. Our finding is consistent with Diao et al. (2017), who use data from the Demographic and Health Surveys (DHS) to study structural change in SSA economies. They find that between 1998 and 2014, the rural female employment share in agriculture has fallen more among women with primary education than without any completed education in both absolute and relative terms.

4.4 Gender gaps

In order to shed light on the evolving differences between male and female labour supply in SSA, we compute male LFPR, male school attendance rates, and male years of schooling for the same cohorts and countries from the IPUMS International data. We further subtract the three variables available for women from the corresponding variables for men to compute cohort gender gaps. A positive value indicates a gender gap in favour of men. Table 7 displays an overview of the three gender gaps by age group. Interestingly, men in the age group 15–24 exhibit both higher school attendance rates and higher LFPR than women in the same age group. There are a number of potential explanations for this descriptive finding: the gender gap in school attendance could be particularly high in some countries and/or cohorts, while the gender gap in LFPR could be particularly high in others, resulting in a positive gap in both variables on average. Men might also be more inclined to enrol in education and participate in the labour market simultaneously than women are.

Table 7: Gender gaps by age group

	Gender gap in...		
Age group	School attendance rates	Years of schooling	LFPR
15–24	0.0882	0.3999	0.0652
25–34	0.0092	0.9306	0.1648
35–44	0.0000	1.212	0.1467

Note: the table reports gender gaps between men and women for the three variables indicated in the column headers and for the three age groups indicated on the left of each row in the SSA sample countries. Positive values imply gender gaps in favour of men.

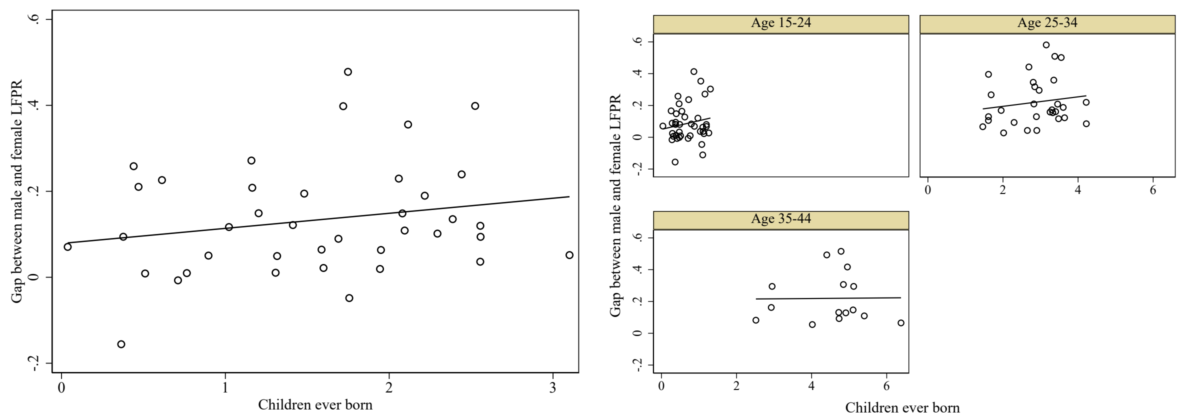
Source: authors' calculations based on data from IPUMS.

Next, we examine the association between the gender gap in LFPR, female fertility, and female educational attainment. The left panel of Figure 8 indicates a positive association between the gender gap in LFPR and female fertility measured in terms of the number of children ever born. An increase in the gender gap implies that women fall further behind men in terms of (market) labour supply. The right panel differentiates the association by age. The individual depictions suggest that the positive correlation is particularly pronounced in the youngest age group (15–24), while the slope of the correlation flattens out as age increases.

Figure 8: Gender gap in LFPR and fertility

(a) Gender gap in LFPR and fertility, pooled

(b) Gender gap and fertility by age group



Note: the left panel shows a scatter plot of the gender gap in LFPR against the number of children ever born to women in the SSA sample countries. The right panel shows scatter plots of the gender gap in LFPR against the number of children ever born to women in the SSA sample countries and census waves differentiated by three age groups.

Source: authors' construction based on data from IPUMS.

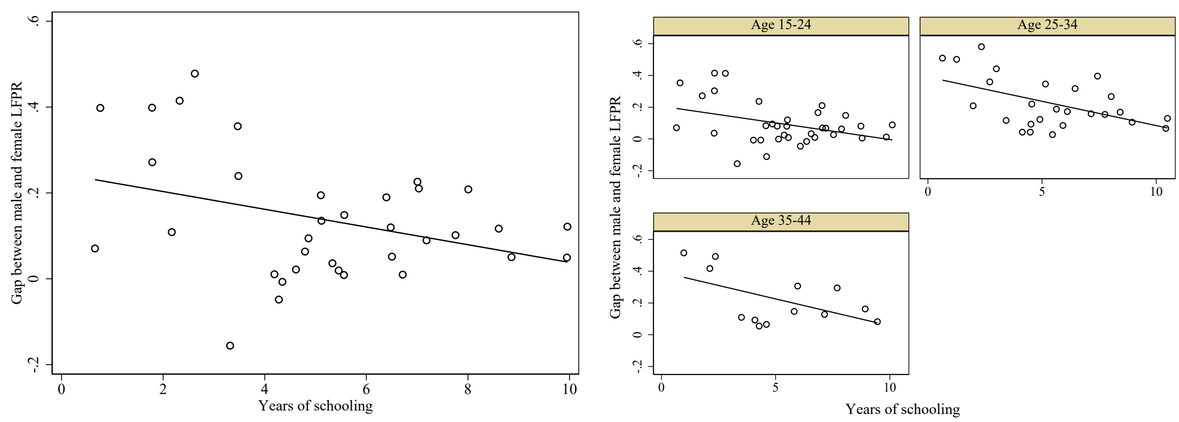
The next set of graphs displays the association between the gender gap in LFPR and female educational attainment measured as years of schooling. The left panel of Figure 9 shows a negative correlation between female educational attainment and the gender gap in LFPR. This correlation is stable across age groups and fairly strong, as displayed in the right panel.

Table 8 reports results from regressing the gender gap in LFPR on fertility and educational characteristics of the female cohorts in our sample. Column 1 reports the result of regressing the gender gap only on the number of children ever born, while controlling for country–age group-specific patterns in the gender gap. The association between the number of children and the gender gap is highly significant and large in magnitude, implying that one additional child is on average associated with a 5.9 pp increase in the gender gap in LFPR. We further interact the number of children with the age group indicators to allow the effect of fertility on the gender gap to vary across the working life. For the youngest female age group (15–24), one additional child is now associated with a 10 pp increase in the gender gap, while the negative and significant interaction effects with the higher age groups imply that the association between fertility and the gender gap is close to zero above the age group 15–24. These patterns are robust to adding the cohort FE to the regression (column 3). We further repeat the estimations using the female years of schooling instead of the number of children as the main explanatory variable. As reported in columns 4–6, female education is at best weakly negatively associated with the gender gap, with the statistical significance disappearing entirely once interactions of schooling with age and cohort FE are added to the regressions.

Figure 9: Gender gap in LFPR and education

(a) Gender gap in LFPR and education, pooled

(b) Gender gap in LFPR and education by age group



Note: the left panel shows a scatter plot of the gender gap in LFPR against the average female years of schooling in the SSA sample countries and census waves. The right panel shows scatter plots of the gender gap in LFPR against the average female years of schooling in the SSA sample countries and census waves differentiated by three age groups.

Source: authors' construction based on data from IPUMS.

These results indicate a negative and sizeable relationship between the early incidence of female fertility and the gender gap in labour supply at early working age. Curiously, our previous results indicated that early female fertility increases female LFPR in early working life due to young mothers being less likely to be enrolled in education. Recall, though, that we only considered a shift from female school attendance to female labour supply as a potential response mechanism to early fertility. Another response mechanism could be that young mothers leave both education and the labour force. The latter mechanism would lower the LFPR of women relative to men and hence increase the gender gap in LFPR.

An extensive treatment of gender gaps beyond SSA can be found in Ganguli et al. (2014), who also use the IPUMS International data, with the latter being limited to the 1990s and early 2000s. They consider not only the gender gap in LFPR, but also the gender gap in education between men and women, the marriage gap in employment between married and unmarried women, and the motherhood gap in employment between women without children and women with three or more children. In their analysis, they find no systematic patterns in the change of the various gaps over time but rather substantial heterogeneity across countries and regions.

Table 8: The gender gap in LFPR

	(1)	(2)	(3)	(4)	(5)	(6)
Children ever born	0.059***	0.104***	0.101***			
	(0.01)	(0.01)	(0.01)			
Age 25–34 × children ever born		–0.087***	–0.091***			
		(0.01)	(0.01)			
Age 35–44 × children ever born		–0.116***	–0.123***			
		(0.01)	(0.02)			
Years of schooling				–0.017*	–0.015	0.027
				(0.01)	(0.01)	(0.02)
Age 25–34 × years of schooling					-0.012	–0.020
					(0.01)	(0.03)
Age 35–44 × years of schooling					0.022	0.008
					(0.01)	(0.04)
Year of birth = 1975			–0.007			–0.019
			(0.01)			(0.02)
Year of birth = 1980			–0.025			–0.046
			(0.02)			(0.03)
Year of birth = 1985			–0.024			–0.072
			(0.02)			(0.04)
Year of birth = 1990			–0.051*			–0.125**
			(0.02)			(0.04)
Year of birth = 1995			–0.038			–0.157**
			(0.03)			(0.05)
Observations	145	145	145	130	130	130
No. clusters	39	39	39	35	35	35
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Age group FE	Yes	Yes	Yes	Yes	Yes	Yes
Country × age group FE	Yes	Yes	Yes	Yes	Yes	Yes

Note: the table reports results from linear regressions of the gender gap in LFPR on the number of children ever born (columns 1–3) and on the female years of schooling (columns 4–6), respectively. Column 1 reports baseline results for including only the number of children in the regression. Column 2 reports estimates of interaction terms of the number of children and the age groups that are added to the regression. Column 3 reports results from adding cohort FE to the regression. Column 4 reports baseline results for including only the female years of schooling in the regression. Column 5 reports estimates of interaction terms of the years of schooling and the age groups that are added to the regression. Column 6 reports results from adding cohort FE to the regression. Country–age group FE are included in every regression. Robust standard errors clustered at the country–age group level arereported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: authors' calculations based on data from IPUMS.

4.5 Country cases

Ghana

The West African country of Ghana is exemplary of the associations between female enrolment in education, labour supply, and fertility. The upper-left panel of Figure 10 displays the strong increase in female school attendance among the youngest cohorts: at age 15, 80 per cent of the female cohort born in 1995 are attending school, while less than 60 per cent of the cohort born in 1985 attended school at the same age. Furthermore, at age 20, the school attendance rate of the female cohort born in 1990 is twice as high as the school attendance rate of the female cohort born ten years earlier. Above age 20, the school attendance rates of the different cohorts converge to a very low level, reflecting that most women have completed their education by age 25 regardless of their birth cohort. The upper-right panel displays the opposing trend in the female LFPR: both at age 15 and at age 20, the female LFPR among the respective younger cohort is 10 pp lower compared to the older cohort. Above age 20, the female LFPR is high and virtually identical for each of the previous two cohorts in comparison. In accordance with the strong increase in school enrolment, female fertility during adolescence decreases among younger cohorts in Ghana, as shown in the mid-left panel of Figure 10. While the share of women with at least one child at age 15 is already relatively low for the cohort born in 1985, it falls to almost zero for the cohort born in

1995. At age 20, the share of mothers declines by more than 10 pp between the cohorts born in 1980 and 1990. The gaps between cohorts at higher ages are still considerable, suggesting that a growing share of Ghanaian women postpone motherhood beyond the period that they spend in education. The mid-right panel indicates that the increasing female school attendance results in younger women accumulating more years of schooling in Ghana. While the difference in terms of years of schooling is rather small between the cohorts born in 1995 and 1985 at age 15, this is potentially due to already achieved broad access to primary education for both cohorts. At ages 20 and 25 the younger cohorts make large gains of about two years of schooling over the older cohorts. The lower-left panel shows an increase across cohorts when it comes to the share of Ghanaian women working in the non-primary sector for ages 20 and older. The lower-right panel indicates hardly any change across cohorts and hardly any differences between age groups in the gender gap in LFPR.

Rwanda

In Rwanda, one of the East African sample countries, the patterns are similar to the ones observed in Ghana, albeit the cohorts being observed at slightly higher ages due to the different timing of the Rwandan census waves. The upper-left panel of Figure 11 displays a strong increase in female school attendance across cohorts within the two youngest age groups. Accordingly, the female LFPR experiences a sharp decline in the youngest age groups, as shown in the upper-right panel. Interestingly, younger female cohorts also exhibit lower LFPR in later working life than older cohorts do. The mid-left panel indicates that the share of mothers in the age group below 20 is already close to zero for the female cohort born in 1985; hence, it does not decrease further for the female cohort born in 1995. Within the age group between age 20 and age 25, however, the share of mothers decreases considerably between the cohort born in 1980 and the cohort born in 1990. The level of schooling acquired by the youngest female cohorts in Rwanda increases substantially below age 25 because of the higher enrolment in education, as indicated in the mid-right panel of Figure 11. Like for Ghanaian women, the share of women in Rwanda employed in the non-primary sector has been increasing across cohorts, albeit from a much lower general level. The gender gap in LFPR seems to have increased slightly across cohorts for age groups above age 25.

Mali

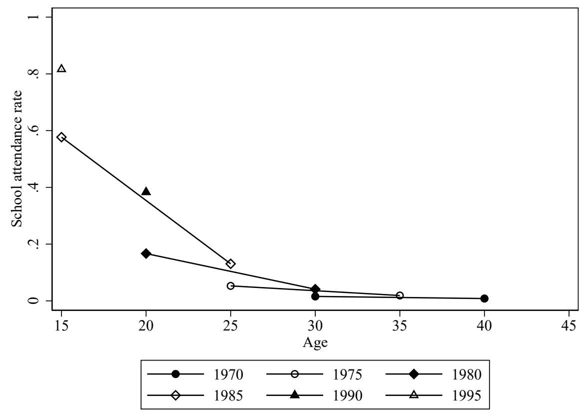
Mali is one of the poorest countries in terms of per capita GDP in our sample. This characteristic is reflected by female enrolment in education generally being at a much lower level than in Ghana and Rwanda, while fertility of Malian women in early working life is considerably higher. The interpretation of the evolution across cohorts is slightly complicated by the Malian census waves being more than ten years apart from each other. However, some variables show strong dynamics across cohorts, at least in relative terms. As shown in the upper-left panel of Figure 12, the female school attendance rate almost doubles below age 20 between the cohort born in 1980 and the cohort born in 1990. The female LFPR, in turn, decreases to a modest extent from older to younger cohorts below age 20, as displayed in the upper-right panel. The share of Malian women who become mothers during adolescence remains rather stable across cohorts, as indicated in the mid-left panel. However, the mid-right panel shows that the average years of schooling acquired by young Malian women increase substantially from one year among the cohort born in 1980 to three years among the cohort born in 1990. While the share of women employed in the non-primary sector has been increasing across birth cohorts, it is still at a rather low level (see lower-left panel). The gender gap in LFPR between Malian men and women is among the highest observed in any country of our sample: up to 50 pp for ages 30 and above.

South Africa

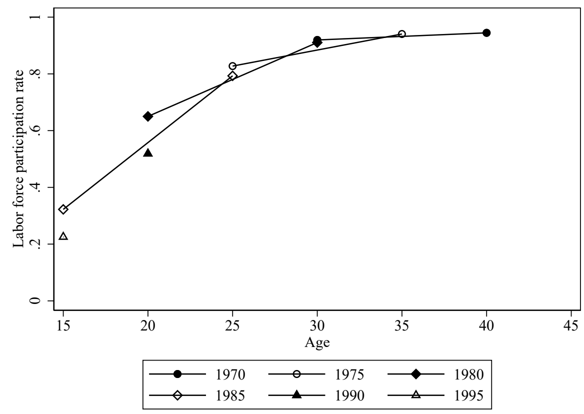
South Africa represents a case that has essentially completed the evolution of schooling, labour supply, and fertility across female cohorts that Ghana and Rwanda are currently undergoing. The various panels of Figure 13 show only a little variation across cohorts at or near the same ages. Female school attendance during early working life is high, while female labour force participation is low, with the variables moving in opposite directions as age increases. Correspondingly, the share of mothers is very low across cohorts at young age and increases with a concave shape across the working life. Between ages 15 and 20, female cohorts in South Africa accumulate more years of schooling on average than in the other three countries, with this figure reaching a plateau shortly above age 20 in South Africa. The large share of women employed in the non-primary sector—much higher than in the other three countries—complements the picture, as does the observed decrease in the gender gap in LFPR for younger cohorts.

Figure 10: Ghana

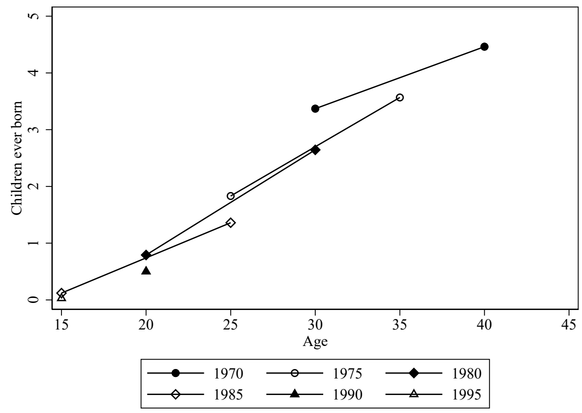
(a) Female school attendance rates in Ghana



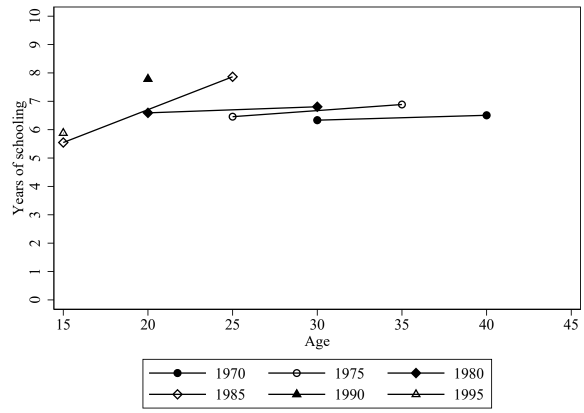
(b) Female LFPR in Ghana



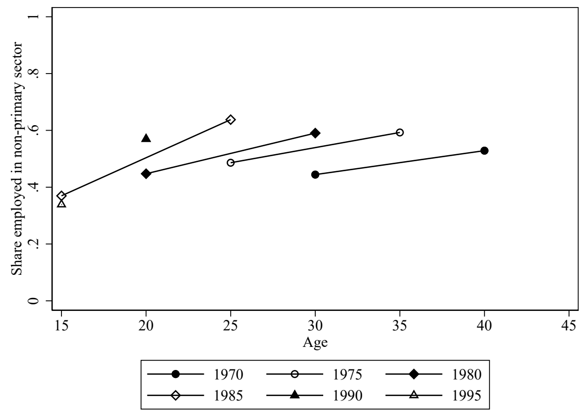
(c) Female fertility in Ghana



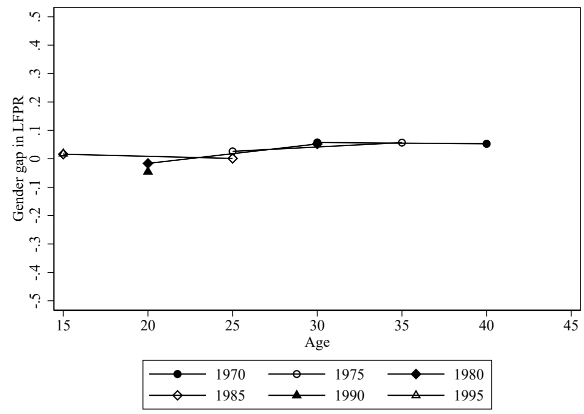
(d) Female years of schooling in Ghana



(e) Female share in non-primary sector in Ghana



(f) Gender gap in LFPR in Ghana

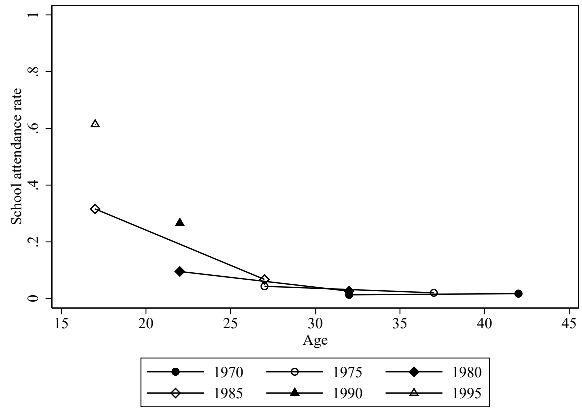


Note: the upper-left panel shows a plot of female school attendance rates by cohort and across age in Ghana. The upper-right panel shows a plot of female LFPR by cohort and across age in Ghana. The mid-left panel shows a plot of the average number of children ever born to women by cohort and across age in Ghana. The mid-right panel shows a plot of the average female years of schooling by cohort and across age in Ghana. The lower-left panel shows a plot of the share of women working in the non-primary sector among all employed women in Ghana. The lower-right panel shows a plot of the gender gap in LFPR in Ghana. Each marker represents one cohort observation, each line connects observations from the same cohort.

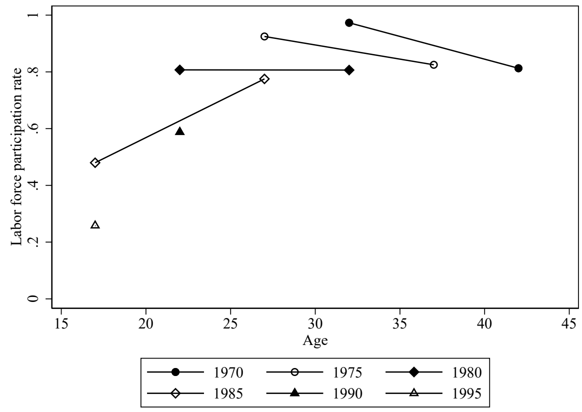
Source: authors' construction based on data from IPUMS.

Figure 11: Rwanda

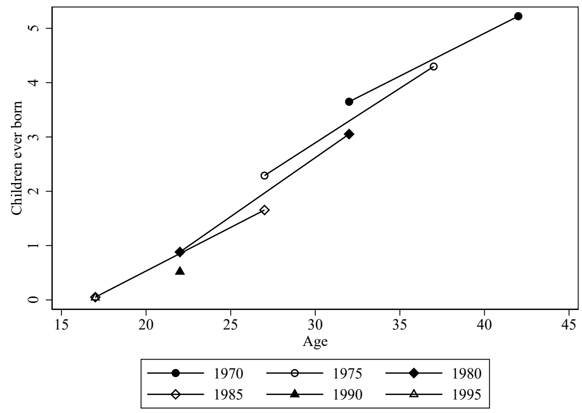
(a) Female school attendance rates in Rwanda



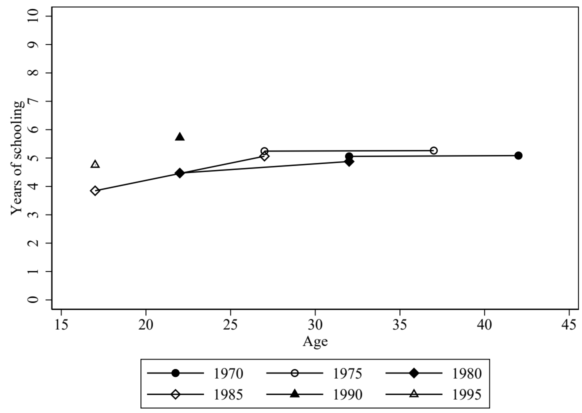
(b) Female LFPR in Rwanda



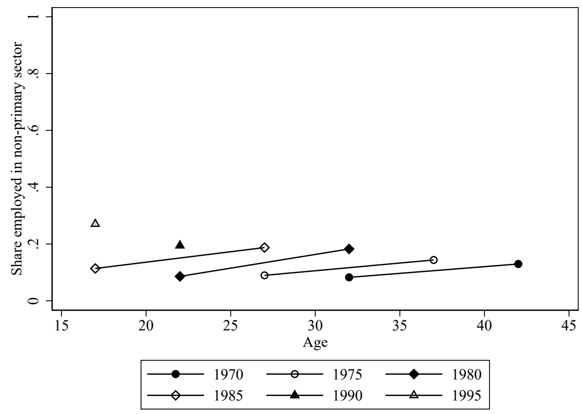
(c) Female fertility in Rwanda



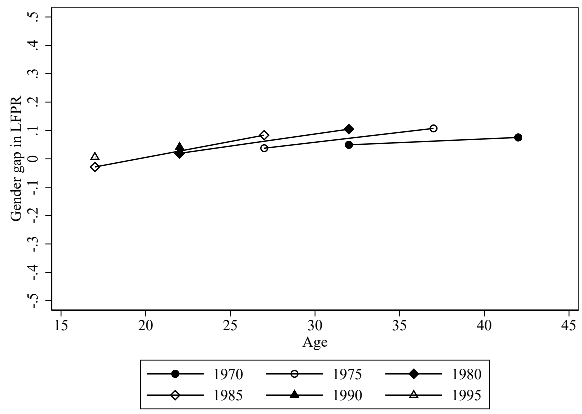
(d) Female years of schooling in Rwanda



(e) Female share in non-primary sector in Rwanda



(f) Gender gap in LFPR in Rwanda

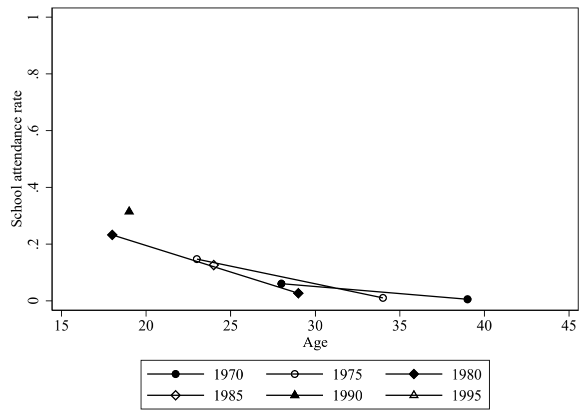


Note: the upper-left panel shows a plot of female school attendance rates by cohort and across age in Rwanda. The upper-right panel shows a plot of female LFPR by cohort and across age in Rwanda. The mid-left panel shows a plot of the average number of children ever born to women by cohort and across age in Rwanda. The mid-right panel shows a plot of the average female years of schooling by cohort and across age in Rwanda. The lower-left panel shows a plot of the share of women working in the non-primary sector among all employed women in Rwanda. The lower-right panel shows a plot of the gender gap in LFPR in Rwanda. Each marker represents one cohort observation, each line connects observations from the same cohort.

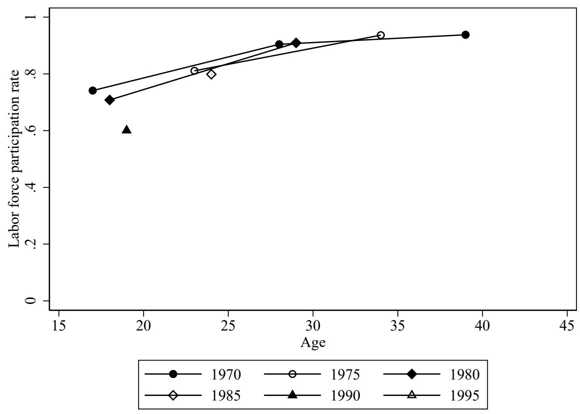
Source: authors' construction based on data from IPUMS.

Figure 12: Mali

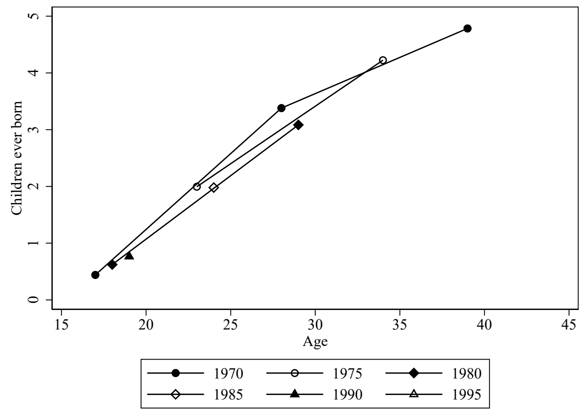
(a) Female school attendance rates in Mali



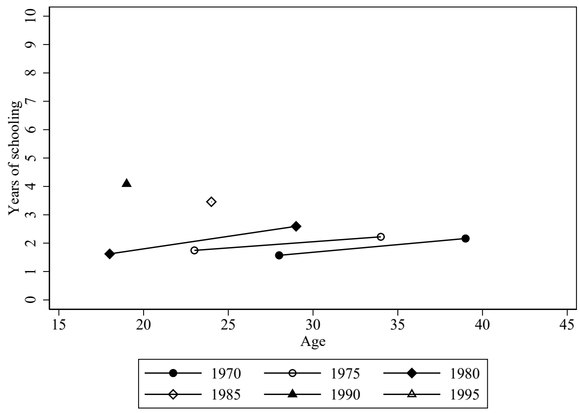
(b) Female LFPR in Mali



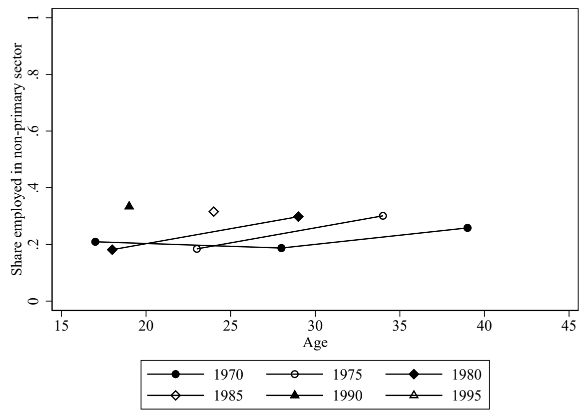
(c) Female fertility in Mali



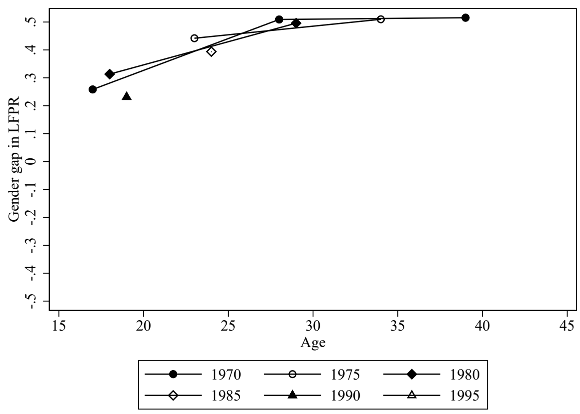
(d) Female years of schooling in Mali



(e) Female share in non-primary sector in Mali



(f) Gender gap in LFPR in Mali

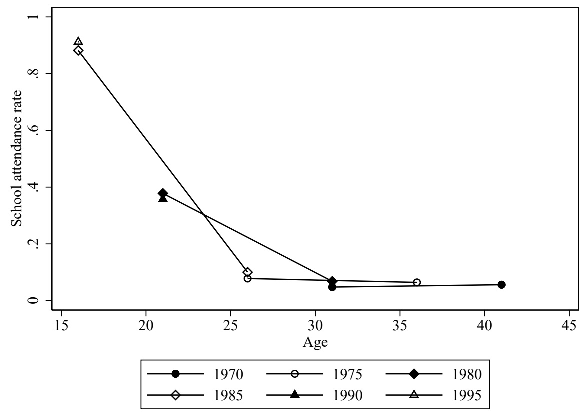


Note: the upper-left panel shows a plot of female school attendance rates by cohort and across age in Mali. The upper-right panel shows a plot of female LFPR by cohort and across age in Mali. The mid-left panel shows a plot of the average number of children ever born to women by cohort and across age in Mali. The mid-right panel shows a plot of the average female years of schooling by cohort and across age in Mali. The lower-left panel shows a plot of the share of women working in the non-primary sector among all employed women in Mali. The lower-right panel shows a plot of the gender gap in LFPR in Mali. Each marker represents one cohort observation, each line connects observations from the same cohort.

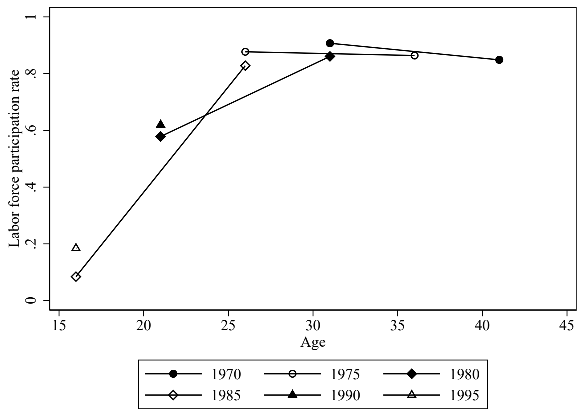
Source: authors' construction based on data from IPUMS.

Figure 13: South Africa

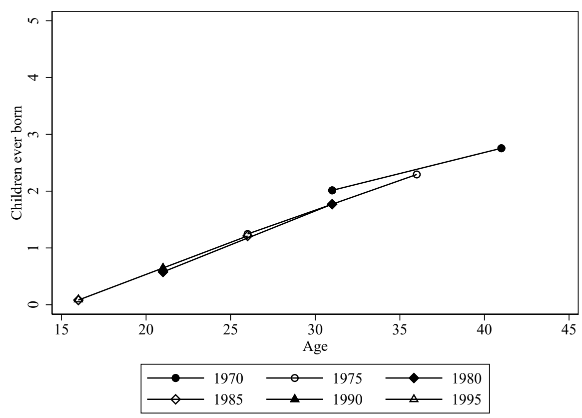
(a) Female school attendance rates in South Africa



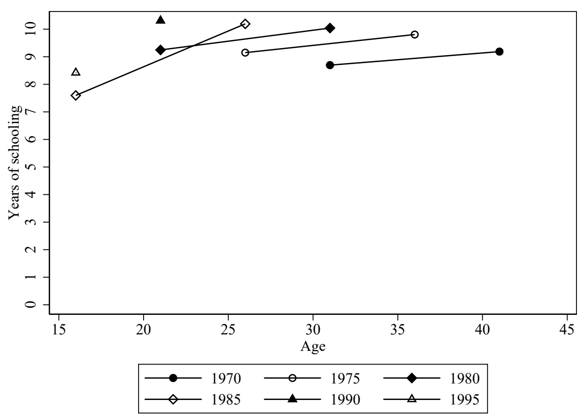
(b) Female LFPR in South Africa



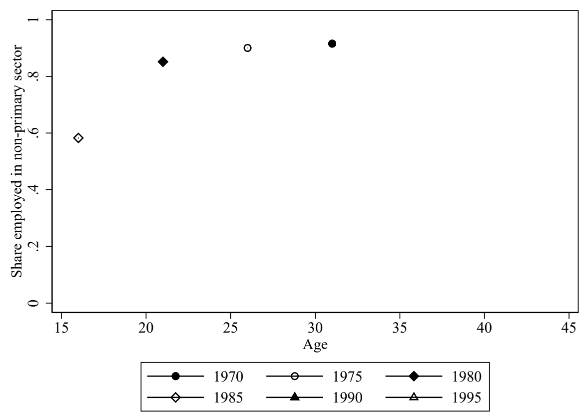
(c) Female fertility in South Africa



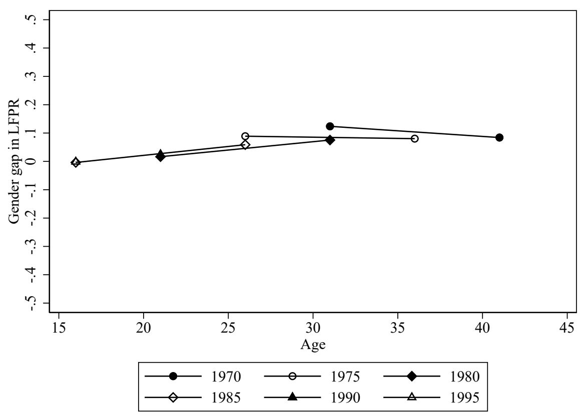
(d) Female years of schooling in South Africa



(e) Female share in non-primary sector in South Africa



(f) Gender gap in LFPR in South Africa



Note: the upper-left panel shows a plot of female school attendance rates by cohort and across age in South Africa. The upper-right panel shows a plot of female LFPR by cohort and across age in South Africa. The mid-left panel shows a plot of the average number of children ever born to women by cohort and across age in South Africa. The mid-right panel shows a plot of the average female years of schooling by cohort and across age in South Africa. The lower-left panel shows a plot of the share of women working in the non-primary sector among all employed women in South Africa. The lower-right panel shows a plot of the gender gap in LFPR in South Africa. Each marker represents one cohort observation, each line connects observations from the same cohort.

Source: authors' construction based on data from IPUMS.

5 Discussion and conclusion

Summarizing our findings, young female cohorts decrease their labour force participation in favour of higher enrolment in education in our sample of SSA countries. Unsurprisingly, this pattern is largely absent in countries where GDP per capita and enrolment in education were already high, such as South Africa. It is much more pronounced in those lower- and middle-income countries that have significantly expanded access to (female) education around the turn of the millennium, such as Ghana and Rwanda. Hence, the decrease in female labour force participation at the beginning of working life should be evaluated by taking into account that young female cohorts have simultaneously made gains in terms of their school attendance and their human capital stock. From this perspective, efforts to increase female enrolment in education have been successful, with the likely inevitable trade-off of lowering female labour supply in early working life.

Our findings further indicate that early motherhood is detrimental to the school enrolment of young women in SSA. Simultaneously, early motherhood also widens the gender gap in LFPR between men and women in early working life. Hence, early motherhood continues to pose a challenge to women's educational and economic empowerment in SSA, although its incidence is decreasing from the older to the younger cohorts. Also encouraging with regard to the human capital gains of young female cohorts is the robust positive association that we find between female educational attainment and female employment in the non-primary sector.

While we do not attribute any causality to the relationships that we estimate across countries, age groups, and cohorts, our findings are nevertheless consistent with causal estimates that have been recovered by (quasi-)experimental studies in a variety of SSA countries.

One limitation of our study is that we do not observe economic outcomes of the sampled populations besides their labour force participation. The higher level of human capital accumulated by the younger female cohorts might translate into higher earnings relative to less educated cohorts once they start participating in the labour force. This, in turn, would imply another trade-off to the falling female labour force participation at early working age. The lack of comprehensive and repeated multi-country data on earnings in SSA continues to pose a limit to these important insights into labour market returns.

A variety of factors will be relevant for translating the recent female gains in human capital into better working lives for women in SSA: social norms might still hinder women in finding employment that would match their human capital while keeping fertility levels up (Jayachandran 2020). Our analysis does not consider the potential role of any 'deep determinants' of female labour supply, as our FE approach eliminates their time-constant contribution to the patterns we are studying. From a more contemporary perspective, it is possible that the observed gains in education do not imply comparable gains in labour market skills. The evidence points to skills being a stronger predictor of labour market returns than formal education (Hanushek et al. 2015), while it has further been pointed out that schooling and skills are only weakly related in some SSA countries (Backhaus 2020). Rodrik (2016) further highlights that the manufacturing value-added as a share of GDP has been declining in SSA since the 1990s. This macro-level trend towards de-industrialization might hamper job growth and employment opportunities for skilled labour around the same time that better-skilled female workers enter the labour market. However, Kruse et al. (2021) find a recovery of manufacturing employment in SSA using more comprehensive and more recent data. Finally, with our sample period ending in the early 2010s, we cannot yet evaluate the life-cycle performance of the young cohorts for which we have detected particularly promising gains in education. The next round of census or comparatively representative data will be more informative about the performance of the female (and male) cohorts born around 1990 at their prime working age and whether they realize an SSA 'demographic dividend'.

The ongoing COVID-19 pandemic poses a threat to both the human capital accumulation and the transition to the labour market of the young cohorts, with the potential for a gender-specific impact. Sumner et al. (2020) estimate that the poverty impact of the pandemic is likely to be concentrated in the poorest regions of the world, with SSA being one of them. A higher risk of poverty could force students to abandon education to supply labour instead, which would paradoxically increase the LFPR in the youngest age groups. At the same time, however, the economic downturn could increase employment in low-quality and unstable jobs and sectors, which has already been detrimentally affecting women in SSA. Addison et al. (2020) note that the pandemic is likely to increase home production outside of the market economy in developing countries, with the time burden likely being imposed on women. Regarding education, Azevedo et al. (2020) simulate that school closures are likely to lead to a reduction in the learning-adjusted years of schooling and a decrease in lifetime income in all regions of the globe. UNESCO (2020) further estimates that SSA is the region with the second-highest number of students globally that are at risk of not returning to education following the closure of educational facilities due to the pandemic. The estimates further indicate that female students are at greater risk of not returning to education in SSA than male students for all educational levels above primary schooling. Another particular aspect affecting women will be the fertility response to the pandemic in SSA countries: if the timing of fertility, in particular of first births, remained stable or the age at first birth even decreased while education stalled and economic outlooks darkened, early motherhood might additionally withdraw young women in SSA from education. Despite the global character of the pandemic, we point out against the backdrop of our study that the impacts of the pandemic will likely be cohort-specific: while the mortality risk is concentrated among the currently older cohorts, the educational and economic risks are particularly pronounced for the young cohorts at school age and early working age. In the worst case, the COVID-19 pandemic might eradicate much of the lifetime gains for the young cohorts in SSA that our results have given reason to anticipate, in particular for women.

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Appendix A: extra tables

Table A1: Sample countries and years

Country	Census years
Benin	2013, 2002, 1992
Botswana	2011, 2001, 1991
Burkina Faso	2006, 1996, 1985
Ghana	2010, 2000
Kenya	2009, 1999, 1989
Lesotho	2006, 1996
Malawi	2008, 1998, 1987
Mali	2009, 1998, 1987
Mozambique	2007, 1997
Rwanda	2012, 2002
Senegal	2013, 2002, 1988
South Africa	2011, 2001
Tanzania	2012, 2002, 1988
Uganda	2014, 2002, 1991
Zambia	2010, 2000, 1990

Source: authors' compilation.

Table A2: Summary statistics by cohort and age group

Age group	Cohort (birth year)					
	1970	1975	1980	1985	1990	1995
Female labor force participation rate						
15–24	0.6019	0.5817	0.6073	0.4244	0.5621	0.3225
25–34	0.7374	0.718	0.7382	0.7168		
35–44	0.766	0.7701				
Female school attendance rate						
15–24	0.1403	0.1745	0.1466	0.3703	0.2339	0.6066
25–34	0.0186	0.0334	0.0355	0.0621		
35–44	0.0235	0.0302				
Female years of schooling						
15–24	4.7	5.2	5.8	6.0	7.3	7
25–34	5.4	6.0	6.4	7.1		
35–44	5.7	6.4				
Children ever born						
15–24	0.7072	1.187	0.9872	0.6651	0.8739	0.2422
25–34	3.423	2.73	3.042	2.026		
35–44	4.607	3.857				
Share that has at least one child						
15–24	0.4243	0.5443	0.5378	0.3358	0.4879	0.1722
25–34	0.9055	0.8467	0.88	0.7774		
35–44	0.9312	0.9136				
Share employed in non-primary sector						
15–24	0.3005	0.1282	0.2237	0.1934	0.3753	0.3732
25–34	0.3204	0.3531	0.4256	0.5007		
35–44	0.3919	0.4862				
Male–female gender gap in LFPR						
15–24	0.1496	0.1375	0.0988	0.0986	0.0722	0.0357
25–34	0.234	0.2257	0.217	0.1797		
35–44	0.2176	0.2055				

Source: authors' calculations based on data from IPUMS.

Table A3: Female LFPR and motherhood at age 15–24

	(1)	(2)	(3)
Share that has at least one child	0.472***	0.043	0.029
	(0.05)	(0.06)	(0.07)
School attendance rate		-0.590***	-0.630***
		(0.07)	(0.09)
Year of birth = 1975			0.043
			(0.04)
Year of birth = 1980			0.059
			(0.04)
Year of birth = 1985			0.020
			(0.04)
Year of birth = 1990			0.054
			(0.04)
Year of birth = 1995			0.077
			(0.06)
Observations	69	69	69
Country FE	Yes	Yes	Yes

Note: the table reports results from linear regressions of the female LFPR at age 15–24 on the share of women who are mothers at age 15–24. The baseline result is reported in column 1. The female school attendance rate at age 15–24 is added to the regression reported in column 2. Cohort FE are added to the regression reported in column 3. Country FE are included in all regressions. Robust standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Source: authors' calculations based on data from IPUMS.