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Abstract

School closures during the COVID-19 pandemic have severely affected the lives of young people globally. This paper presents evidence on the return of young women to school in six sub-Saharan African countries during the pandemic. The analysis of representative survey data on women aged 15-25 indicates that in countries where restrictions on schools have been short-lived, both school re-opening and return to school have occurred broadly, with little variation across age, while female school attendance remains strongly depressed below pre-pandemic levels in countries where restrictions were still in place. Both women whose schools have remained closed and women who have already returned to school are less likely to have given birth or supplied labor during the pandemic than women who had already left school prior to COVID-19, while women who have not returned to school exhibit a significantly higher birth rate than the latter. Further, women who have not returned to school are less likely to perform independent and paid work than women who had already left school prior to COVID-19, while they are just as likely to supply low-quality labor, indicating labor market scarring effects among the non-returning women.

Keywords: Developing countries, Education, Women

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1 Introduction

The COVID-19 pandemic and the measures taken with the purpose of containing it had drastic impacts on the lives of young people globally. In particular, these impacts concern the realm of education due to extended restrictions on schools and other educational institutions enacted in a large number of countries initially in spring 2020, often lasting far into the year 2021, and barring millions of children and adolescents from regular in-person instruction (UNICEF, 2021a,b).

While the pandemic-related restrictions have overwhelmingly been lifted by now, important questions remain: Following the lifting of the restrictions, to what extent has school attendance recovered? How has this recovery been moderated by the varying stringency and duration of the restrictions across countries? What has been the impact of the enforced absence from school on the school-age population?

The uncertainty surrounding these questions is particularly high in sub-Saharan African countries for a number of reasons: Due to the high prevalence of poverty, economic constraints may force students to join the labor market during extended periods of school closures, making a return to school less likely even as restrictions on schools are lifted again. Female adolescents in sub-Saharan Africa were already at the highest risk of pregnancy globally before the COVID-19 pandemic; the disruption of education could potentially further increase this risk accompanied by the well-known challenges that early childbearing poses to the continued education of young mothers. Gaps in the official schooling data of some sub-Saharan African countries complicate the surveillance of school re-opening and the return of students to instruction. Accordingly, concerns about the educational and life-cycle impacts of the COVID-19 pandemic on young women in sub-Saharan Africa have been raised (Azevedo et al., 2021; Backhaus and Loichinger, 2022; De Paz et al., 2020; UNESCO, 2020).

In response to these concerns, this paper presents evidence on the return of young women to school in six sub-Saharan African countries between the end of the year 2020 and the beginning of the year 2022. Representative survey data on women aged 15-25 collected by the Performance Monitoring for Action (PMA) project allow estimating rates of pre-pandemic school attendance, school re-opening, and return to school following re-opening. The results indicate that in countries where restrictions on schools have been short-lived, both school re-opening and return to school have occurred broadly, with little variation across age, while female school attendance remains strongly depressed below pre-pandemic levels in countries where restrictions on schools have been longer lasting. Both women whose schools have remained under lockdown and women who have already returned to school are less likely to have given birth or supplied labor during the pandemic than women who had already left school prior to COVID-19, while women who have not returned to school exhibit a significantly higher birth rate than the latter. Further, women who have not returned to school are less likely to perform independent and paid work than women who had already left school prior to COVID-19, while they are just as likely to supply low-quality labor.

The gendered impacts of the COVID-19 pandemic and the ongoing recovery from them are the focus of a growing empirical literature, with a particular emphasis on the schooling and the human capital accumulation of children and adolescents in African countries (Ahinkorah et al., 2021; Bundervoet et al., 2022; Duby et al., 2022; Flor et al., 2022; Kidman et al., 2022; Nieves et al., 2021; Zulaika et al., 2022). This paper contributes multi-country evidence on the recovery of female school attendance from the COVID-19-related restrictions, with the data allowing for a direct comparison to the pre-pandemic attendance, a differentiation between school re-opening and return to school as two components to this recovery. The paper further contributes evidence on the socio-demographic consequences of the pandemic by analysing female fertility and labor supply patterns conditional on the school attendance since the outbreak of COVID-19. While the literature on learning losses during the pandemic justifiably focuses on the school attendance of children and early adolescents due to the importance of primary and lower secondary schooling for the formation of cognitive skills (Angrist et al., 2021; Azevedo et al., 2023; Sabarwal et al., 2023), the female adolescents and young women considered in this paper are potentially more prone to dropping out of school permanently due to a higher propensity of them entering the labor market or entering motherhood during the school closures than younger girls.

The remainder of the paper is organized as follows: Section 2 provides information on the survey design, the timing of the survey in relation to the COVID-19-related restrictions on schools in the different sample countries, as well as summary statistics on the female respondents. Section 3 presents results on the decline in female school attendance since the beginning of the pandemic, followed by a decomposition of this decline into lasting school closures and non-return to school after re-opening. The section further presents regression results on fertility and labor supply outcomes of the female respondents conditional on the re-opening of their schools and their return to school. Section 4 puts the results into the context of the existing evidence and discusses limitations of the available data. Section 5 concludes.

2 Data

2.1 Survey design

This paper uses representative survey data on women of reproductive age (15-49) collected in six sub-Saharan African countries by the Performance Monitoring for Action (PMA) project. These six countries are Burkina Faso, Cote d'Ivoire, the Democratic Republic of the Congo (DR Congo), Kenya, Niger, and Uganda (ISSP et al., 2021; Tulane University et al., 2021; ENSEA et al., 2022; ICRHK et al., 2021; Institut National de la Statistique du Niger et al., 2022; Makerere University et al., 2021). The surveys were collected during the COVID-19 pandemic as the so-called Phase 2 of the longitudinal version of PMA launched initially in 2019/20. For more details on the survey design in each country, please refer to the corresponding user notes provided with each data set (PMA, 2021a, 2022a, 2021b, 2022b,c,d).

While the PMA surveys are primarily interested in reproductive health, the Phase 2 also contained schooling-related items in the context of the COVID-19 pandemic: First, all surveyed adolescent women between age 15 and age 25 were asked whether they had been attending school when the COVID-19 pandemic led to measures closing down the schools[1]. Next, those women who responded that they had been attending school by that time were asked whether their school had since then re-opened. In this regard, a limitation of the survey is that only the questionnaire for Uganda explicitly asks respondents to consider not only in-person but also online instruction as a form of school re-opening, while the questionnaires for the other countries do not contain instructions for how to take online instruction into account. The published data from Uganda do not differentiate then between the two forms of school re-opening, making any investigation into the prevalence of online instruction in this country impossible. Finally, those women who responded that their school had re-opened since the COVID-19-related closures were asked whether they had returned to their re-opened school. Hence, outflows of school attendance from the pre-

[1] For convenience, this paper uses the terms "adolescents" and "young adults" interchangeably for individuals aged 15-25.

pandemic baseline could have occurred at two different stages: first, by closed-down schools not re-opening and second, by adolescent women not returning to schools which have re-opened. The survey further provides information on background characteristics of the female respondents, such as their age, their level of education attended, a wealth score for their household, their labor supply, and their fertility. The fertility information is collected such that it allows differentiating births of children that have occurred prior to the pandemic from births that have occurred during the pandemic.

At the sub-national level, the samples cover all 13 regions of Burkina Faso, all 7 regions of Niger and the capital district of Niamey, all 15 sub-regions of Uganda, and nearly all of the 31 regions of Cote d'Ivoire. The Kenyan sample, while covering only 11 out of the country's 47 counties, is still geographically diverse, as it includes counties from almost all of Kenya's former eight provinces, among them the capital of Nairobi. The sample from the DR Congo is the most restricted one in terms of sub-national coverage, as it only draws on the capital province of Kinshasa and the neighboring, westernmost province of Kongo Central, leaving out 24 of the country's 26 provinces.

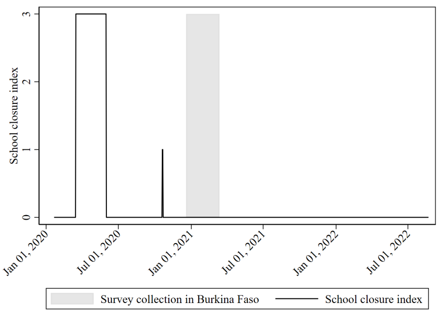
2.2 Survey timings and restrictions on schools

The differential timings of the survey collection and the school closures creates variation in the stringency of the school closures by the time of the respective survey collection across the sample countries. This variation is displayed in Figure 1 using data on school closures collected by Hale et al. (2021); their school closure index takes integer values from 0 (no measures related to school closures are taken) to 3 (school closures are required at all levels of instruction). The index increases if the level of restrictions is raised in any sub-national jurisdiction of the respective country; it therefore does not capture any potential sub-national variation in school closures but reflects only the strictest measures implemented in at least one sub-national jurisdiction.

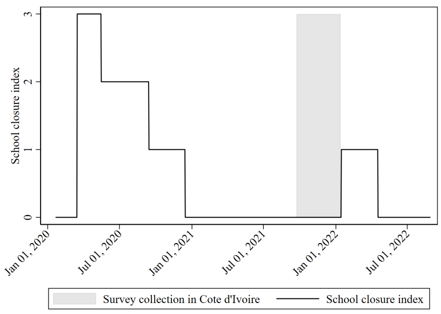
When the PMA Phase 2 survey was collected in Burkina Faso by the turn of the year 2020/21, the country had long since abandoned any mandatory or recommended school closures after the early months of the pandemic, with a very brief resurgence of recommended school closures in late 2020 (Panel 1a). Cote d'Ivoire had been phasing out the restrictions on schools more gradually over the course of the year 2020; nevertheless, the collection of the PMA Phase 2 survey took place only in late 2021, leaving a gap of nearly one year between the end of the restrictions and the data collection, while preceding a temporary reinstatement of recommended measures in early 2022 (Panel 1b). The DR Congo saw changes in its restrictions on schools in varying directions during the survey collection at the turn of the year 2020/21: Starting from a relatively low level of stringency, restrictions were briefly completely ceased, only to be briefly tightened to the highest stringency afterwards, with the end of the renewed lockdown coinciding with the end of the survey collection (Panel 1c). Kenya had been mandating school closures at all levels of instruction since the outbreak of the pandemic for a longer period than the previously discussed countries, easing restrictions on some levels of instruction only briefly before the PMA Phase 2 survey collection and not easing them further before the end of the data collection in late 2020 (Panel 1d). Niger had phased out all restrictions on schools in a similar fashion as observed in Burkina Faso and Cote d'Ivoire by the end of the year 2020 and not reinstated them; consequently, no restrictions on schools were in place when the PMA Phase 2 survey was collected at the beginning of the year 2022 (Panel 1e). Among the six sample countries, Uganda had enacted the most restrictive and long-lasting measures on schools, mandating school closures at some or all levels widely throughout the year 2021, with the PMA Phase 2 survey collection in late 2021 coinciding with a period of the most stringent restrictions on schools (Panel 1f).

2.3 Summary statistics

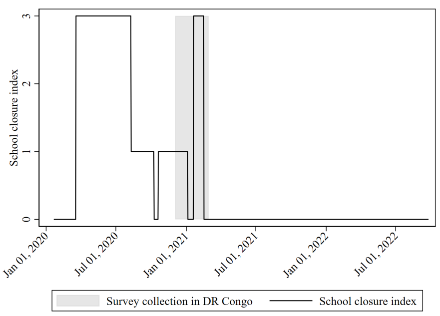
Table 1 presents summary statistics on the sample used in the following analysis. Among the full sample of women aged 15-25, 53% had already stopped their education prior to COVID-19; hence, 47% were attending school when COVID-19 restrictions were put in place in their respective country. Among these attendees, 76% reported that their school had re-opened by the time the various PMA Phase 2 surveys were collected, while 81% of the women who reported that their school had re-opened have returned to school. Consequently, school attendance among the full sample has decreased to 29% by the time of the data collection, implying an unadjusted decline of female school attendance by 18 percentage points or 38%. This decline is composed of a share of 12% of women who have not seen their schools re-open and a share of 7% who have not returned to school after re-opening. The average age of the sampled women is 18.6 years. 28% of the sample have not attended any level of education, 15% have attended primary education, 53% have attended secondary education, and 4% have attended tertiary or a different level of higher education. Among the respondents who had been enrolled in education when COVID-19 closed down the schools, 18% were still attending primary education, while the large majority of 77% was attending secondary education; only a small share of 5% was attending tertiary education. By the time of the PMA Phase 2 surveys, 7% of the respondents had recently performed paid and independent work, while 22% had recently supplied some labor beyond their own housework. 28% had at least once given birth, 22% had given birth prior to the COVID-19 pandemic, and 12% had given birth during the pandemic. 6% reported they were currently pregnant. In total, 17% of the respondents had either given birth during the pandemic or were currently pregnant.



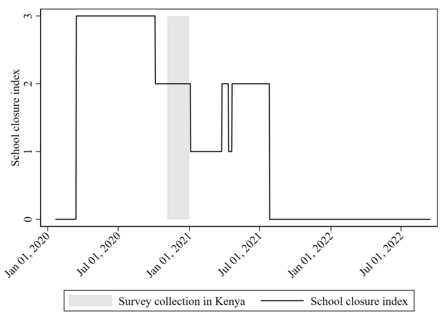
(a) Burkina Faso



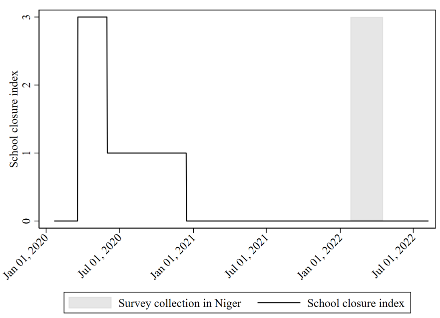
(b) Cote d'Ivoire



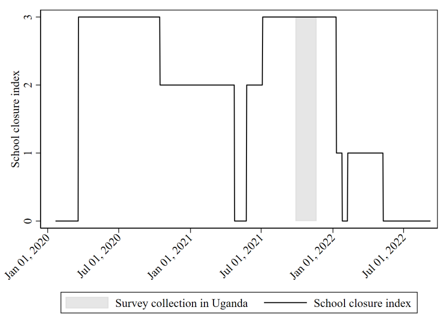
(c) DR Congo



(d) Kenya



(e) Niger



(f) Uganda

Figure 1: Survey and school closure periods

Notes: Each panel displays the timing of the PMA survey and the temporal variation in the stringency of school closures in the respective country. Data on the stringency of school closures is taken from Hale et al. (2021). An index of 3 indicates that school closures are required at all levels of instruction, of 2 that closures are required only at some levels, of 1 that closures are only recommened, and of 0 that no measures related to school closures are taken. *Source:* Author's own depictions.

Table 1: Summary statistics

	N	Mean
School attendance before and since COVID-19		
Not attending school before and since COVID-19	8309	0.53
Attending school when COVID-19 closed down schools	8309	0.47
School has re-opened after COVID-19 restrictions were lifted	4391	0.76
Has returned to school after re-opening	3433	0.81
Attending school again after schools re-opened	8309	0.29
Attending school before COVID-19 but not anymore	8309	0.18
Attending school before COVID-19 but school still closed	8309	0.12
Attending school before COVID-19 but not returned	8309	0.07
Demographics:		
Age at last birthday	8309	18.56
Female	8309	1
Highest level of education ever attended:		
No education	8309	0.28
Primary education	8309	0.15
Secondary education	8309	0.53
Tertiary education or higher	8309	0.04
Level of education attended before COVID-19:		
No education	4391	0.00
Primary education	4391	0.18
Secondary education	4391	0.77
Tertiary education or higher	4391	0.05
Economic characteristics:		
Wealth score	8309	-0.42
Done any independent and paid work in last 30 days	8309	0.07
Done any work aside from own housework in last 7 days	8308	0.22
Fertility:		
Ever given birth	8309	0.28
Given birth before COVID-19	8309	0.22
Given birth since COVID-19	8309	0.12
Currently pregnant	8309	0.06
Given birth during COVID-19 or currently pregnant	8309	0.17

Notes: The table presents summary statistics on the sample. Female survey weights are applied.

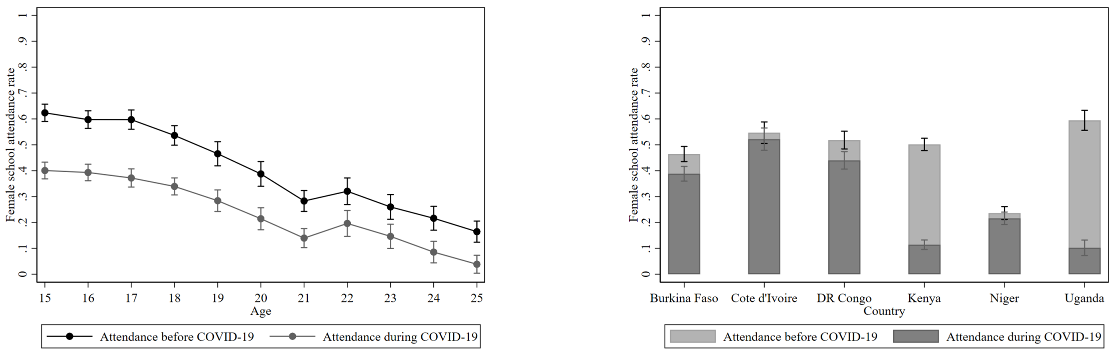
3 Results

3.1 Decline in female school attendance during COVID-19

Figure 2 displays direct comparisons of the female school attendance rates prior to COVID-19 and since the beginning of the pandemic. The pre-pandemic baseline rates are calculated based on whether female respondents stated that they had been attending school when COVID-19-related restrictions were imposed, while the attendance rates during the pandemic result from taking into account whether the initially attending female respondents reported that their schools had re-opened and whether they have returned to school.

Panel 2a displays the age profiles of female school attendance prior and during the pandemic, adjusted for unobserved and time-invariant country heterogeneity[2]. Female school attendance has declined at every year of age during the pandemic in comparison to the pre-pandemic baseline, with the largest absolute decline of more than 20 percentage points having occurred at the low end of the surveyed age spectrum and the largest relative decline of more than 75% being observed at the top end.

Panel 2b, in turn, differentiates the decline in female school attendance by country after adjusting for the age of the respondents. This differentiation reveals stark contrasts between the six sample countries: The pandemic-related decline in school attendance is found to be enormous in Kenya and Uganda, amounting to between 40 and 50 percentage points, while it is considerably smaller in the order of 10 percentage points in Burkina Faso and the DR Congo, two countries with a similar baseline attendance rate as Kenya and Uganda. Cote d'Ivoire has retained its comparatively high pre-pandemic female attendance rate to the greatest extend, while Niger saw a similarly small absolute decline of its attendance rate but from a much lower baseline. Age profiles estimated separately for each country are presented in Figure A1 in the Appendix.



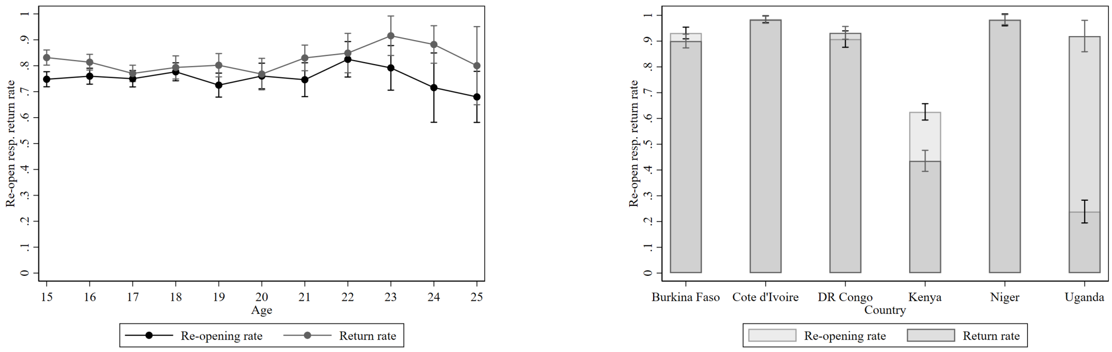
(a) Attendance by age

(b) Attendance by country

Figure 2: Female school attendance prior to and during COVID-19

Notes: The left panel displays cross-country age profiles of female school attendance before (black line) and during (grey line) the COVID-19 pandemic. The right panel displays country-by-country age-adjusted female school attenrance rates before and during the COVID-19 pandemic. Female survey weights are applied. *Source:* Author's own depictions.

[2]While the age of the respondents by the time of the survey collection is observed, the respondents' age by the time of the initial lockdowns on schools being imposed in March 2020 cannot be precisely calculated. Therefore, the horizontal axis only displays the age by the time of the survey collection. While the interval between March 2020 and the survey collection varies across countries, the adjustment for the unobserved and time-invariant country heterogeneity intends to absorb this potential source of bias.



(a) Re-opening and return rates by age

(b) Re-opening and return rates by country

Figure 3: School re-opening and return to school

Notes: The left panel displays cross-country age profiles of the school re-opening rate (black line) and the female return to school rate (grey line). The right panel displays country-by-country age-adjusted school re-opening and female return to school rates before and during the COVID-19 pandemic. Female survey weights are applied. *Source:* Author's own depictions.

3.2 Decomposing the decline in school attendance

Figure 3 decomposes the decline in female school attendance into the two elements of school re-opening after the loosening of the COVID-19 restrictions and actual return of female students to schools which had re-opened.

Panel 3a displays the age profiles of school re-opening and return to school after adjusting for unobserved and time-invariant country heterogeneity. The patterns of school re-opening and return to school are very similar to each other, averaging between 70% and 80%, with a larger divergence at the top end of the observed age spectrum, where however the precision of the estimated rates simultaneously decreases due to the small number of women still enrolled at that age. This pattern suggests that COVID-19-related restrictions have been eased uniformly at all levels of instruction implicitly considered here. The likewise stable rates at which female students of different ages have returned to their schools further suggest that the school closures have not resulted in an age-specific attrition of female students in places where closures have been repealed.

As shown in Panel 3b, in Burkina Faso, Cote d'Ivoire, the DR Congo, and Niger, age-adjusted rates of school re-opening and return to school have both been high and quantitatively similar to each other. In Uganda, the re-opening rate has been low at around 20% due to the continued mandatory school closures, but the rate at which female students have returned to the few re-opened schools has been high, averaging about 90%. Kenya is the only sample country where the rate at which female students have returned to re-opened schools markedly underperforms the rate of school re-opening: While around 60% of female students reported that their schools have re-opened, only around 40% of among those whose schools have re-opened have also returned to school. Age profiles estimated separately for each country are presented in Figure A2 in the Appendix.

Figure A3 in the Appendix further displays re-opening rates of schools (Panel A3a) and return to school rates (Panel A3b) differentiated by the level of education and for each sample country separately. Re-opening rates either do not exhibit substantial variation across the three levels of education within each country, or the differences are not statistically significant due to the imprecisely estimated re-opening rates for some levels of education which were attended only by few women in the sample. The pattern is broadly similar when considering the return to school rates, with the exception of the return to secondary schooling clearly underperforming the other two levels in Kenya.

3.3 Female outcomes conditional on return to school

Table 2 reports results from linearly regressing various fertility outcomes on indicators for the school re-opening and attendance status of women by the time of the PMA Phase 2 survey collection. All regressions include age fixed effects, country fixed effects, and fixed effects for five household wealth quintiles. Outcomes considered are an indicator for current pregnancy (columns 1-3), an indicator for whether at least one birth has occurred since the beginning of the pandemic (columns 4-6), and an indicator for either current pregnancy or a birth having occurred since the outbreak of COVID-19 (columns 7-9).

In Panel A, the female respondents are allocated to three distinct groups conditional on their school attendance prior to and during the COVID-19 pandemic: (1) those who had already left or never attended school prior to the pandemic nor since then, (2) those who had been attending school when the pandemic broke out but whose schools have not re-opened since then, (3) and those who had been attending school when the pandemic began and whose schools have re-opened. Using the first group of women as the baseline, column 1 reports that the probability of being pregnant is lower both for women who had been attending school but are still affected by school closures and for women who had been attending school and whose schools have re-opened, with the difference being significant for each group and amounting to 2.7 and 3.1 percentage points respectively relative to a baseline pregnancy rate of 7.5%. The regression reported in column 2 additionally controls for the highest level of schooling of the respondents. The rationale for including this control is the following: All sampled women who have never attended school are by construction included in the baseline group. These women may exhibit fundamentally different fertility profiles than women who have received at least some schooling; hence, controlling for this particular composition of the baseline group is advisable. As a result, the previously significant differences between the three groups in terms of pregnancy rates vanish, implying that the pregnancy rates of the three groups are aligned despite their different pre-pandemic school attendance and the different re-opening status of the schools. This result remains unchanged when additionally controlling for whether births had occurred prior to the pandemic and allowing births prior to COVID-19 to affect the probability of being pregnant differently for women whose schools have remained closed and those whose schools have re-opened, as reported in column 3.

Next, column 4 reports that both women whose schools have re-opened and women whose schools have remained closed are significantly less likely to have given birth since the beginning of the pandemic than women who had already been out of school prior to COVID-19. The difference in the probability of having given birth since COVID-19 amounts to 6.3 percentage points for women whose schools have not-reopened and to 8.7 percentage points for women whose schools have re-opened, relative to a baseline birth rate of 15.4%. An F test further rejects the null hypothesis that the magnitudes of the differences are statistically indistinguishable between these two groups. The differences again decline substantially to magnitudes of 2.3 resp. 2.5 percentage points once controlling for the level of schooling, as reported in column 5, while they remain statistically significant though. The F test now does not reject the null of no statistical difference between the birth rates of women whose schools have remained closed and women whose schools have re-opened. Further adjusting the regression for pre-pandemic and group-specific birth patterns only marginally decreases the magnitudes of both estimated coefficients to 2.2 percentage points, as reported in column 6.

Lastly, using the indicator for either current pregnancy or having given birth during the pandemic as the outcome variable, the estimated differences are quantitatively similar to the regressions that only use births as the outcome variable once all controls are added to the regressions; they are furthermore at least weakly statistically significant for both groups of women but not quantitatively different between them once the control for the level of schooling is added (columns 7-9).

In sum, both women whose schools have remained closed and women whose schools have re-opened do not exhibit lower rates of pregnancy than women who had already been out of school prior to the pandemic. While this finding is possibly due to the relatively rare occurrence of pregnancies overall, both groups of women then show significantly lower rates of birth events since the beginning of the pandemic. Hence, the prolonged school closures have not resulted in a complete levelling of the fertility differences between women who had been out of school before the pandemic and women who had been attending school until the pandemic, even if the latter could not fully return to school yet by the time of the PMA Phase 2 surveys. Interestingly, no significant fertility differences can be detected between women whose school have remained closed and women whose schools have already re-opened, as indicated by the high p-values of the F tests.

In Panel B, the group of women who have been attending school by the outbreak of COVID-19 and whose schools have re-opened since then is further differentiated, yielding a total of four distinct groups of women: (1) those who had already left or never attended school prior to the pandemic nor since then, (2) those who had been attending school when the pandemic broke out but whose schools have not re-opened since then, (3) those who did not return to school despite their schools having re-opened, and (4) those whose schools have re-opened and who have returned to them. The results reveal a strong degree of heterogeneity in terms of fertility outcomes between the two added groups: Using all available controls, women who have not returned to school despite their school having re-opened exhibit a weakly significant and higher pregnancy rate than the baseline group (column 3). The non-returnees further exhibit a significantly higher birth rate than the baseline group, with the difference amounting to nearly 4 percentage points or 30% relative to the baseline rate, while the women who have returned are significantly less likely to have given birth since COVID-19, with a similar magnitude in absolute terms (column 6). Using the joint indicator for any birth since COVID-19 and/or current pregnancy, the positive and highly significant difference in events among the non-returnees adds up to 6 percentage points relative to the baseline, while the negative and similarly highly significant difference for the returnees amounts to 4.7 percentage points (column 9). These striking contrasts suggest that once schools re-open, the group of women whose past attendance had been interrupted by the COVID-19-related restrictions splits into one group who does not return to school and who has been experiencing fertility events during the pandemic at higher rates than women who had already been out of school and another group who has returned to school and who has been experiencing fertility events less frequently.

Additionally, Figure 4 displays the result of allowing the differences in birth events since COVID-19 presented in Panel B of Table 2 to vary across the respondents' age. Due to high imprecision of the estimates for single years of age, the four school-related group indicators are interacted with a binary indicator that takes the value of 0 if the respondent's age falls within the range 15-19 and the value of 1 for the age range 20-25. In the age group 15-19, the birth rates of women who had been out of school prior to COVID-19, whose schools have not re-opened yet, who have not returned to school, and who have returned are similar to each other, with the point estimates not exceeding 10%. This pattern suggests that the previously noted differences in birth rates between these groups are not driven by births among the youngest women in the sample. Indeed, only when considering the age group 20-25 do birth rates deviate strongly between women who had already been out of school or who have not returned to school on the one hand and women whose schools have not re-opened or who have returned to school on the other hand.

Table 2: Fertility conditional on return to school

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Dependent variable:		Pregnant			Birth since COVID-19			Birth during COVID-19 or pregnant	
Panel A:									
Out of school before COVID-19	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
School still closed during COVID-19	-0.027***	-0.010	-0.004	-0.063***	-0.023**	-0.022**	-0.088***	-0.031***	-0.025**
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.012)	(0.012)	(0.012)
School re-opened during COVID-19	-0.031***	-0.005	0.001	-0.087***	-0.025***	-0.022**	-0.116***	-0.028***	-0.020*
	(0.007)	(0.007)	(0.008)	(0.009)	(0.009)	(0.009)	(0.011)	(0.011)	(0.011)
$p(\beta_{Not\,re-opened} - \beta_{Re-opened} = 0)$	0.600	0.591	0.550	0.009	0.806	0.971	0.020	0.796	0.637
Panel B:									
Out of school before COVID-19	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted	omitted
	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)	(.)
School still closed during COVID-19	-0.025***	-0.009	-0.004	-0.056***	-0.020**	-0.020**	-0.079***	-0.028**	-0.022*
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.012)	(0.012)	(0.012)
School re-opened but not returned	-0.001	0.016	0.022*	-0.005	0.033**	0.039***	-0.006	0.048***	0.060***
	(0.012)	(0.012)	(0.012)	(0.014)	(0.014)	(0.014)	(0.017)	(0.017)	(0.017)
School re-opened and returned to school	-0.039***	-0.013	-0.007	-0.108***	-0.045***	-0.043***	-0.144***	-0.055***	-0.047***
	(0.007)	(0.008)	(0.008)	(0.009)	(0.010)	(0.010)	(0.011)	(0.012)	(0.012)
Observations	8309	8309	8309	8309	8309	8309	8309	8309	8309
Age FE; Country FE; Wealth quintile FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Level of schooling FE	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Control for birth before COVID-19	No	No	Yes	No	No	Yes	No	No	Yes
Not re-opened × Birth before COVID-19	No	No	Yes	No	No	Yes	No	No	Yes
Re-opened × Birth before COVID-19	No	No	Yes	No	No	Yes	No	No	Yes
Baseline rate	0.075	0.064	0.063	0.154	0.129	0.129	0.222	0.186	0.185

Notes: The table reports results from linear regressions of fertility indicators on indicators for female school attendance prior to and during the COVID-19 pandemic. In columns 1-3, the outcome variable is a binary indicator for whether a woman is currently pregnant. In columns 4-6, the outcome variable is a binary indicator for whether a woman has given birth since the beginning of the COVID-19 pandemic. In columns 7-9, the outcome variable is a binary indicator for whether a woman has given birth since the beginning of the COVID-19 pandemic or is currently pregnant. Age fixed effects, country fixed effects, and wealth quintile fixed effects included in every regression. Female survey weights applied. Robust standard errors displayed in parentheses. *** p<0.01, ** p<0.05, * p<0.1

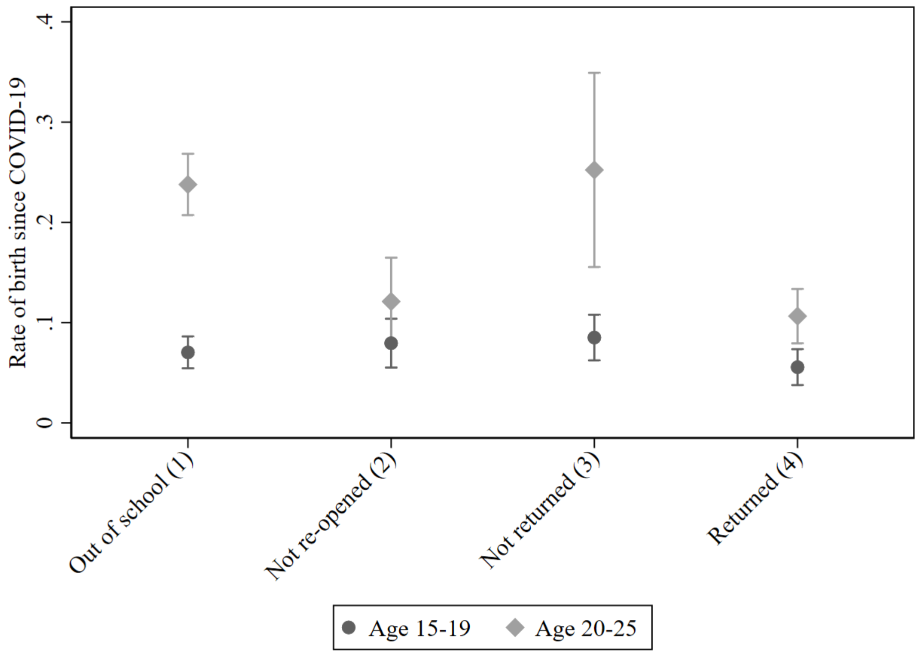


Figure 4: Age profiles of birth events since COVID-19 by school attendance

Notes: The plot displays birth rates of women since the beginning of the COVID-19 pandemic conditional on the women's school attendance prior to and since the pandemic: Women had either been (1) already out of school prior to COVID-19, (2) attending school prior to COVID-19 but not having their schools re-opened, (3) attending school prior to COVID-19, having their schools re-opened but not having returned to school, or (4) attending school prior to COVID-19, having their schools re-opened and having returned to school. Within each group, estimates are differentiated by whether a woman belonged to the age group 15-19 or 20-25. The underlying regression adjusts for country fixed effects, wealth quintile fixed effects, level of schooling fixed effects, and interaction effects between births prior to COVID-19 and the four groups of women. Female survey weights are applied. The whisker plots indicate 95% confidence intervals. *Source:* Author's own depictions.

Next, the analysis of female labor supply conditional on school (re-)attendance uses two binary indicators as outcome variables: first, an indicator for whether a woman has performed any independent and paid work in the last 30 days and second, an indicator for whether a women has done any work aside from her own housework in the last 7 days. The latter outcome is more broadly defined, as it may encompass unpaid labor supplied to e.g. a family farm or family business. This difference is reflected in the baseline rates of the two outcomes among the women who had already been out of school prior to the pandemic: Approx. 8% of them reported having performed independent and paid work, while approx. 25% of them reported having done any work aside from their own housework. Labor supplied in form of any independent and paid work may therefore be considered as rather formal, more economically remunerative and hence of higher quality than any labor supplied beyond a respondent's own housework.

Panel A of Table 3 presents results from regressing the two binary labor supply indicators on the indicators for women who had attended school until COVID-19 and have not seen their schools re-open and for women who had attended school prior to the pandemic and whose schools have re-opened, respectively, with the women who had already left school before COVID-19 or never attended school forming again the baseline group. While it was to be expected that women who had already been out of school prior to COVID-19 would supply more labor than women who had been attending school until the pandemic, the results in column 1 show that women who had once attended school but whose schools have not re-opened and women whose schools have re-opened are both significantly less likely to have recently performed independent and paid work compared to women who had already been out of school, with no statistical difference between the former two groups, as indicated by the high p-value of the F test. These results do not change when controlling for the level of schooling and for whether a woman has ever given birth (column 2). When using the indicator for work aside from one's own housework as the outcome, the absolute magnitudes of the estimates increase and both estimates remain negative and statistically significant, as shown in columns 3 and 4.

In Panel B, the group of women whose schools have re-opened is again further differentiated into one group which has not returned to school despite the re-opening and another group which has returned after the re-opening. In contrast to the previously presented divergence in terms of fertility outcomes, columns 1 and 2 suggest that women who have not returned to re-opened schools and women who have returned are similarly less likely to have recently supplied high-quality labor than women who had already been out of school before the pandemic. However, columns 3 and 4 then reveal that there is no statistically significant difference in the supply of low-quality labor between women who had already been out of school and women who have not returned to school after re-opening, with the negative and significant difference observed in Panel A being entirely driven by women who have returned to school. This result bears closer resemblance to the pattern observed with regard to the fertility outcomes: While women whose schools are still under lockdown remain relatively strongly averse to supplying low-quality labor, women who do not return to their re-opened schools are not statistically distinguishable from women who had already been out of school in terms of their supply of low-quality labor. Women who have returned to school, in turn, are then the least inclined to supply this type of labor. The patterns observed in Panel B suggest that women who have not returned to their re-opened schools are not more likely to supply high-quality labor than women who have returned to school, despite the former group not allocating any time to formal education anymore. Further, the non-returnees are as likely to supply low-quality labor as women who had already been out of school before the pandemic, suggesting that non-returnees have entered the labor markets predominantly in the low-skill segments of the latter.

Table 3: Female labor supply conditional on return to school

Dependent variable:	(1) Independent paid work in last 30 days	(2) Independent paid work in last 30 days	(3) Work aside from own housework in last 7 days	(4) Work aside from own housework in last 7 days
Panel A:				
Out of school before COVID-19	omitted	omitted	omitted	omitted
	(.)	(.)	(.)	(.)
School still closed during COVID-19	-0.025***	-0.029***	-0.063***	-0.047**
	(0.010)	(0.010)	(0.020)	(0.021)
School re-opened during COVID-19	-0.032***	-0.039***	-0.065***	-0.046***
	(0.008)	(0.009)	(0.014)	(0.015)
$p(\beta_{Not\,returned} - \beta_{Returned} = 0)$	0.479	0.324	0.897	0.954
Panel B:				
Out of school before COVID-19	omitted	omitted	omitted	omitted
	(.)	(.)	(.)	(.)
School still closed during COVID-19	-0.025***	-0.029***	-0.059***	-0.045**
	(0.010)	(0.010)	(0.020)	(0.021)
School re-opened but not returned	-0.035***	-0.039***	-0.007	0.009
	(0.012)	(0.012)	(0.023)	(0.023)
School re-opened and returned to school	-0.031***	-0.039***	-0.082***	-0.065***
	(0.009)	(0.010)	(0.015)	(0.017)
Observations	8309	8309	8308	8308
Age FE; Country FE; Wealth quintile FE	Yes	Yes	Yes	Yes
Level of schooling FE	No	Yes	No	Yes
Control for ever given birth	No	Yes	No	Yes
Baseline rate	0.083	0.086	0.246	0.239

Notes: The table reports results from linear regressions of labor supply indicators on indicators for female school attendance prior to and during the COVID-19 pandemic. In columns 1-2, the outcome variable is a binary indicator for whether a woman has done any independent paid work in the last 30 days. In columns 3-4, the outcome variable is a binary indicator for whether a woman has done any work aside from her own housework in the last 7 days. Age fixed effects, country fixed effects, and wealth quintile fixed effects included in every regression. Female survey weights applied. Robust standard errors displayed in parentheses. *** p<0.01, ** p<0.05, * p<0.1

4 Discussion

The results in context

The presented evidence in Figure 2 of high rates of return to school in the sample countries where schools have re-opened is overall consistent with the rate of return to school estimated by Kidman et al. (2022) for adolescent girls below age 20 in Malawi. However, Kidman et al. (2022) further estimate a drop-out rate of more than 30% among adolescent girls aged 17-19, which in turn resembles the average decline in female school attendance estimated for these ages across the six sample countries. Following the lifting of the comparatively short-lived school closures in West Africa, Caballero et al. (2021) find high rates of return to school among students of the Rising Academy Network schools in Sierra Leone, Liberia, and Ghana. Comparing adolescent women who graduated from secondary school in rural western Kenya shortly before the pandemic with adolescent women who were scheduled to graduate in March 2021, Zulaika et al. (2022) find that the latter cohort of women, who were affected by the COVID-19-related school closures, experienced higher rates of school dropout and pregnancy, while supplying more non-school-related labor than the pre-COVID-19 cohort, consistent with the low rates of school re-opening and return to school presented for Kenya in this study.

The issue of return to school following the lifting of the COVID-19-related restrictions is intrinsically linked to the matter of learning losses among students, given that school attendance represents an essential component to learning. A report by UNESCO (2022) compares the share of teenage students that reach minimum proficiency levels in reading and mathematics in six sub-Saharan African countries by mid-2021 with the pre-pandemic share in 2019. The countries covered by the report include Burkina Faso, Cote d'Ivoire, and Kenya, whereas only mathematical proficiency was assessed in Kenya. Kenya is also the only country that exhibits a significant decline in the share of students who reach the minimum proficiency level in mathematics between 2019 and 2021, while the shares in the other countries either remain stable or increase. This result is consistent with the longer lasting school closures and the comparatively low rate of return to school in Kenya reported in this study, potentially underlining the importance of rebounding school attendance for the avoidance of learning losses.

The regression results presented in Table 2 indicate differential fertility patterns among the female sample population conditional on the state of school re-opening and return to school. The striking finding from this analysis is that after adjusting for the highest level of schooling attended, women who have not returned to school despite their schools having re-opened exhibit a statistically higher birth rate than women who had already left school prior to the pandemic, even when controlling for pre-pandemic fertility. In contrast, women who have returned to school after re-opening are considerably less likely to have experienced fertility events since the beginning of the pandemic than women who had already been out of school before, followed by women whose schools have remained closed. While existing research did not find evidence for a general increase in pregnancies in several of the sub-Saharan African countries covered by PMA during COVID-19 (Backhaus, 2022; Moreau et al., 2023), these studies compare the likelihood of pregnancies during the pandemic to the likelihood of pregnancies prior to the pandemic. This paper rather points to a division of adolescent women into one group that has remained attached to schooling during the period of the school closures and has meanwhile largely refrained from sexual reproduction, and another group whose attachment to schooling has been dissolved during the school closures and which has experienced reproductive events. The regression results presented in Table 3 further suggest that women who have not returned to school after their schools had re-opened perform rather poorly in the labor market; compared to women who had left school already before the pandemic, they are less likely to supply paid and independent labor but are just as likely to supply rather informal labor close to their households. This result may suggest potential labor market scarring effects from the pandemic as highlighted by Schady and Silva (2023). It should be noted though that the present study compares the labor market outcomes of women who were affected by the pandemic-related school closures to the outcomes of women who had already left school by March 2020; obviously, the pandemic has also affected the latter's labor market situation. Therefore, it remains to be seen how these two groups compare when labor markets will have fully entered the post-pandemic phase and whether the potential scarring effects will persist.

The detected patterns of elevated fertility and poor labor market outcomes among the non-returnees apply to a non-negligible share of 12% among the pre-pandemic female school population who did not return to school after schools had re-opened. This share that is likely to grow further once all schools eventually re-open in all sample countries, as this will ultimately break up the group of women whose schools have still been closed by the time of the survey collection into the two disjoint groups of returnees and non-returnees. Note, however, that this drop-out rate and the associated patterns are not necessarily implying any pandemic "excess" drop-out or fertility, as a certain share of students is expected to leave education in any period.

Potential limitations

This study uses individual-level data on the female population aged 15-25 in six African countries. Consequently, all estimated rates of school attendance, school re-opening, and return to school are based on self-reported information from the respondents, which could potentially deviate from official statistics reported by educational administrations for a variety of reasons. For example, official statistics might overstate the recovery from the COVID-19-related restrictions for political reasons. This possibility is related to the important aspect noted by Sabarwal et al. (2023): Even as schools re-opened, instructional hours were often reduced over an extended period in many places. The PMA data does not permit investigating such potential differences between the extensive and the intensive margin of return to school in the sample countries.

Further, the data used for this study cannot tell to what extend the lack of in-school instruction during the COVID-19-related school closures was potentially compensated by remote instruction and learning outside of school. However, the existing evidence suggests that remote learning opportunities and take-up during COVID-19 were generally inadequate across sub-Saharan Africa (Sabarwal et al., 2023), with even relatively affluent countries such as Kenya performing poorly and not achieving equity (Malenya and Ohba, 2023; Uwezo, 2020; Muñoz-Najar et al., 2021). Additional evidence from Kenya further suggests that adolescent women were required to prioritize household chores over remote learning during the school closures, resulting in gendered learning inequality (Mbushi et al., 2022). Consequently, the extent to which un- or misreported remote learning might distort the picture arising from the reported rates of school re-opening and return to school may be small.

Regarding the gendered impacts of the COVID-19-related restrictions on school, the PMA surveys, due to their focus on the female population of reproductive age, do not provide data on adolescent men of the same detail and hence do not permit a direct comparison of the return to school between adolescent men and women. While pregnancies and births during the pandemic may be assumed to detrimentally affect the school attendance of women as compared to men, this does not necessarily apply to potentially gendered profiles of labor supply, too: For example, adolescent men might be more inclined to have joined the labor force during the school closures and remain more attached to it even as schools have re-opened than adolescent women, potentially depressing male school attendance in the aftermath of the school closures. In turn, men may enjoy advantages over women in entering the formal labor market, possibly allowing the former to earn higher returns, given that women are generally overrepresented in the informal economy of sub-Saharan Africa (ILO, 2018).

A worthwhile question is whether the regression results reported in Tables 2 and 3 can be interpreted as causal effects of the school closure and re-opening policies on the female fertility and labor supply outcomes, as the re-opening of schools can be regarded as a policy change that was exogenous to the female respondents' individual characteristics. However, at least two components for a convincing differences-in-differences-type estimation are missing: First, while the PMA Phase 2 surveys that provide the data for this study are part of a longitudinal data collection effort, the potential of exploiting the longitudinal dimension in combination with the PMA Phase 1 surveys is limited by a large share of the observations not being observed across survey waves but only in either Phase 1 or 2. An implication of the limited longitudinal dimension of the data is that it is difficult to underpin the crucial assumption of parallel trends between the treatment and the control group with an appropriate inspection of the pre-pandemic period. Second, as highlighted in Figure A2, school re-opening varies primarily at the country level, i.e. most sample countries have seen their schools either nearly fully re-open or remain nearly fully closed. As a consequence, the identifying variation used for estimating the school re-opening coefficient stems predominantly from a comparison of women in e.g. Burkina Faso whose schools have re-opened to women in e.g. Uganda whose schools have remained closed, as opposed to a comparison of women conditional on their school re-opening status within the same country. The former comparison is not a priori invalid but whether it is indeed informative about the policy effect depends on the extent one is willing to abstract from the different country contexts in which these policy changes have occurred.

5 Conclusion

Achieving inclusive and equitable quality education has been a top priority of the global development agenda. The restrictions imposed on schools during the COVID-19 pandemic justifiably raised grave concerns whether the arduous efforts that had been invested in expanding female educational attainment in sub-Saharan Africa could be foiled by the unpredictable consequences of barring adolescents from in-person instruction, often without providing sufficient means for remote learning.

In this context, this study provides evidence that the school attendance of young women has recovered broadly though not completely in four sub-Saharan African countries where the most stringent restrictions on schools had mostly been limited to the initial months of the pandemic. In two other sub-Saharan African countries though, female school attendance remains severely depressed relative to pre-pandemic levels, in the case of Kenya mainly due to a low rate of return to school and in the case of Uganda primarily due to prolonged school closures.

Surprisingly, both the policy-driven re-opening of schools and the individual-level decision-making about whether to return to school yield very similar patterns of re-opening and return across the age spectrum of the female sample population. While discontinuation of education is a concern irrespective of the age of the former students, it is particularly worrisome that the youngest women in the sample have not experienced a stronger rebound of their school attendance from the pandemic than older women, as it implies that the former have likely lost more potential years of education which they would have acquired in the future had they returned to school.

While the high rate of reproductive events among women who have not returned to school despite their schools having re-opened may partly be driven by self-selection of women with stronger preferences for fertility into non-return to school, this process may nevertheless have been prevented or delayed by schooling not having been interrupted by the pandemic or having resumed sooner. The elevated share of non-returning women entering motherhood further makes it unlikely that these women might return to education at a later point in time. Complementing this with the low rate of reproductive events among women who have returned to school points to a growing disparity and polarization among school-aged women in sub-Saharan Africa near the end of the COVID-19 pandemic; a disparity that is poised to grow further once the last pandemic-related school closures will have been lifted and which in combination with the poor labor market outcomes of non-returning women may reinforce itself over the life-cycle.

As a consequence, additional educational initiatives in sub-Saharan African countries could be targeted at young adult women who have already left school, potentially providing rather on-the-job training to bolster their skills or subsidizing their re-entry into the educational system.

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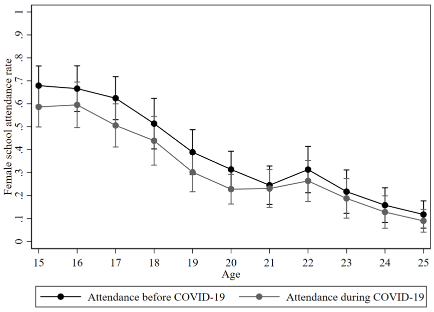
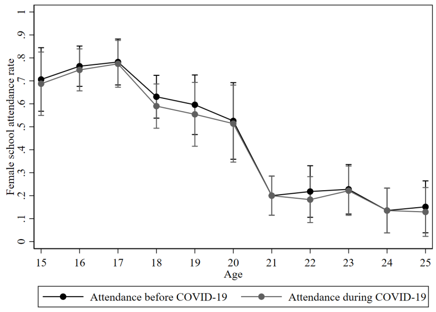
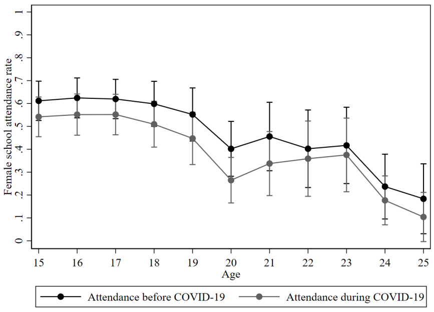
A Appendix



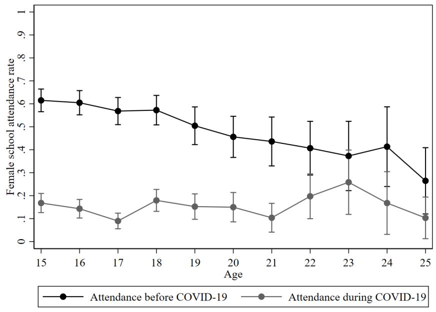
(a) Burkina Faso



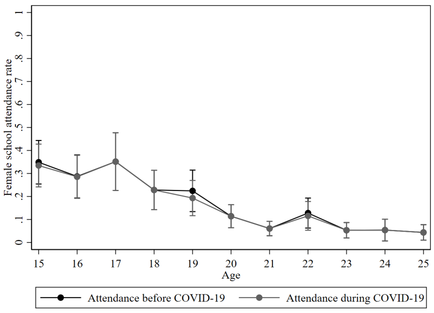
(b) Cote d'Ivoire



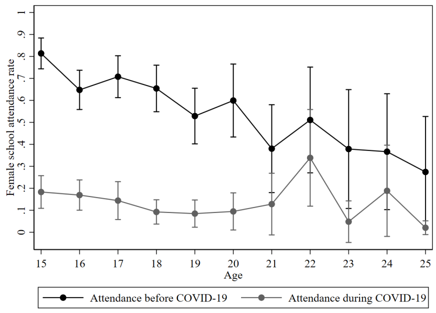
(c) DR Congo



(d) Kenya



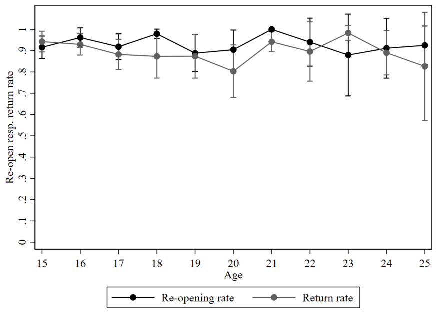
(e) Niger



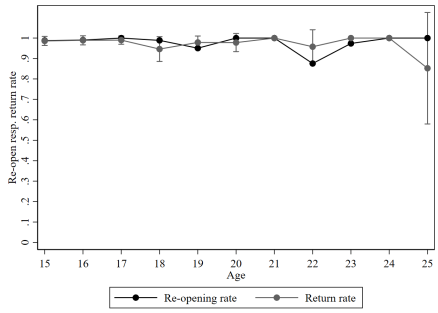
(f) Uganda

Figure A1: Age profiles of female school attendance prior to and during COVID-19

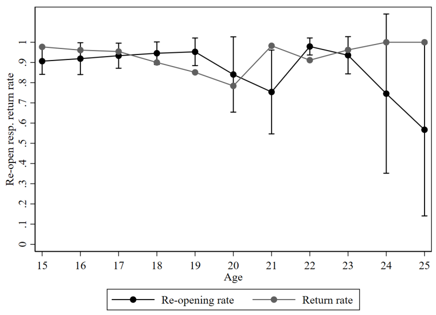
Notes: Each panel displays age patterns of female school attendance before (black line) and during (grey line) the COVID-19 pandemic in the respective country. *Source:* Author's own depictions.



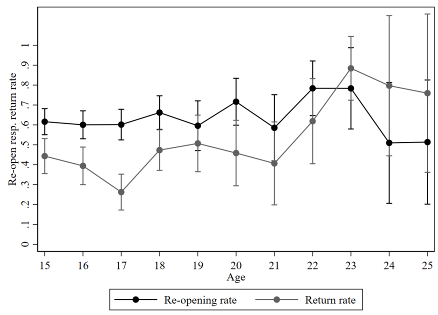
(a) Burkina Faso



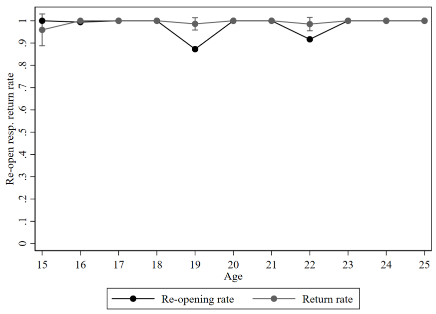
(b) Cote d'Ivoire



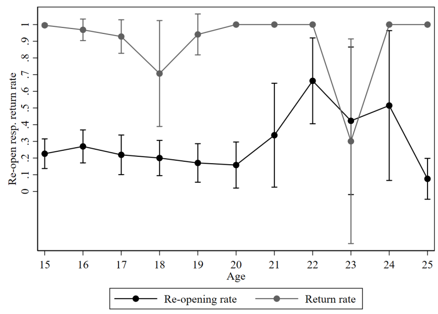
(c) DR Congo



(d) Kenya



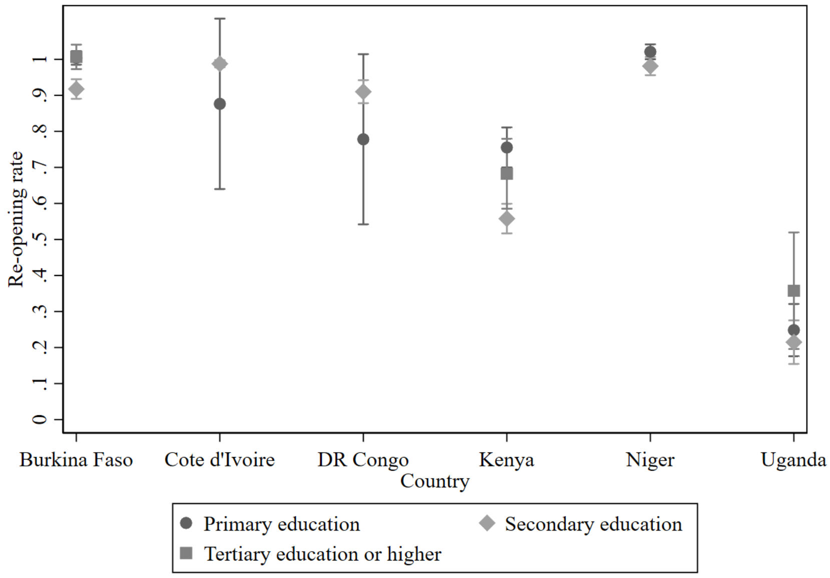
(e) Niger



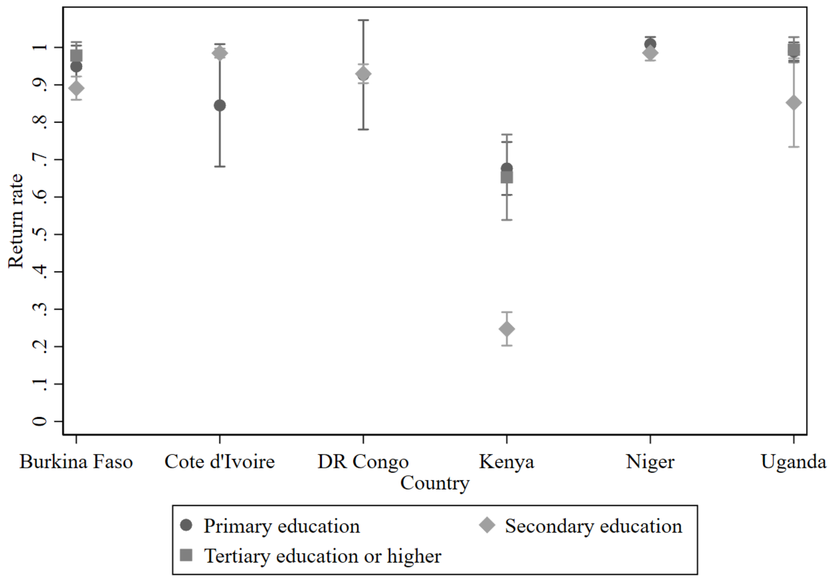
(f) Uganda

Figure A2: Age profiles of school re-opening and return to school

Notes: Each panel displays age patterns of school re-opening rates (black line) and rates of female return to school (grey line) during the COVID-19 pandemic in the respective country. *Source:* Author's own depictions.



(a) Re-opening rates by level of education and country



(b) Return rates by level of education and country

Figure A3: School re-opening and return rates by level of education and country

Notes: The upper panel displays re-opening rates of school within each sample country, differentiated by the level of education. The lower panel displays return to school rates within each sample country, differentiated by the level of education. Female survey weights are applied. *Source:* Author's own depictions.