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COVID-19 and Children's School Resilience

Evidence from Nigeria

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Abstract

This paper analyzes the impact of COVID-19 lockdown measures on children's school resilience. Using an individual fixed-effect linear probability model on Nigeria data, it exploits the quasi-randomness of these measures to estimate their effect on school attendance after the lockdown was lifted. The results show that COVID-19 lockdown measures reduced children's probability of attending school after the school system reopened. This negative impact increased with children's age, reaching a peak among those whose education was no longer compulsory. For schoolchildren in that age group, the negative effect of COVID-19 lockdown measures is likely to be permanent, which, if not reversed, will undermine the quality of the economy-wide future labor force. The paper also finds evidence that in the child marriage-prone North-West part of Nigeria that these measures increased gender inequality in education among children aged 12 to 18. This result suggests that COVID-19 lockdown measures may exacerbate harmful traditional practices such as child marriage.

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COVID-19 and Children's School Resilience: Evidence from Nigeria *

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1 Introduction

For many children worldwide, particularly those from low-income family backgrounds, schooling represents the only avenue for escaping the intergenerational transmission of poverty. However, in the developing world, the common occurrence of aggregate income shocks threatens children's pursuit of schooling, which their parents view as a costly investment. In these countries, evidence shows that aggregate income shocks increase children's vulnerability to child labor or child marriage (Corno and Voena (2016), Corno et al. (2020))—two cultural practices known to undermine children's schooling outcomes (Canagarajah and Coulombe, 1999; Field and Ambrus, 2008). It is therefore not surprising that, when in early 2020 the COVID-19 pandemic erupted, concerns immediately arose over possible setbacks in terms of progress achieved on education outcomes (UNICEF, 2021b). The justification behind these concerns is that this outbreak led to the enactment of protracted economy-wide lockdown measures, with implications for household income and food security. However, since school closure was only temporary, and in some environments schoolchildren were allowed to maintain contact with their schools through distance learning, it is unclear whether such concerns were justified.

This paper uses a unique data set from Nigeria to test the hypothesis that COVID-19 school lockdown measures undermine children's school resilience by reducing the number of those who returned to school after these measures were lifted. The literature on the effect of COVID-19 on children's learning outcomes is growing but still predominantly focused on developed countries where distance learning resources are more easily accessible during the pandemic. Yet, of the 142 million children predicted to fall into poverty due to COVID-19, nearly two-thirds live in Sub-Saharan Africa and South Asia,[1] where access to distance learning is already severely limited. Indeed, many children from low-income backgrounds do not have internet access.[2] Moreover, evidence from past covariate income shocks such as droughts shows that Sub-Saharan African countries, where risk-insurance markets are imperfect, experience a breakdown of informal risk-sharing mechanisms (Kazianga and Udry, 2006; Fafchamps and Gubert, 2007), exacerbating the impacts of these shocks. In this context, it is feared that low-income families' mitiga-

[1] See *UNICEF data hub*, accessed online at `https://data.unicef.org/covid-19-and-children/`
[2] See *UNICEF data hub*, accessed online at `https://data.unicef.org/covid-19-and-children/`

tion strategies against the socioeconomic crisis induced by COVID-19 may increase child marriage and child labor (UNICEF, 2021a).

The facts mentioned above make the context of Nigeria all the more relevant to our study. It is a Sub-Saharan African country with a Poverty Headcount Index of 40.10%.[3] Furthermore, *Demographic and Health Survey* (DHS) evidence shows a 43% prevalence of child marriage in Nigeria among married women aged $20-24$. Additionally, data from the Multiple Indicator Cluster Survey (MICS) indicate a high prevalence of child labor among children aged $5-17$ in Nigeria. For example, in 2007, the prevalence of child labor among children aged $5-14$ years was 28.9%, while in 2011, this share was 57.1% for children aged 5-11. In 2016-2017, around one in two children aged $5-17$ was involved in child labor (50.8%) of which 54.3% were boys, and 47.2% were girls.[4] Both these figures are well above the Sub-Saharan Africa region's average of 37% for child marriage and 29% for child labor. They underscore the importance of education in Nigeria.

To identify the effect of nationwide COVID-19 lockdown measures on children's probability of school attendance after schools' reopening, we use a panel of school-age individuals observed just before schools' closure and just after schools' reopening and rely on the quasi-randomness of the occurrence of the pandemic. We draw from Mahmud and Riley (2021) by estimating a fixed-effect linear probability model. However, despite the plausible exogeneity of the COVID-19 shock, the potential simultaneous occurrence of other covariate shocks (e.g., climate shocks) can confound the identification of its effect on children's school attendance. Indeed, in the context of Nigeria, whose territory is partially located in the drought-prone western Sahel region, the concomitant occurrence of climate shocks such as drought or floods is highly probable. We control for exposure to climate shocks and shocks to household size both before the COVID-19 shock and post-shock to account for this potential threat to identification.

Additionally, we control for age-specific school attendance trends to account for the effect of age on school participation. Moreover, security shocks such as *Boko Haram*'s deadly incursions in the North-East part of Nigeria are also potential confounders of the

[3]See the World Bank's Global Poverty Working group at `https://data.worldbank.org/indicator/SI.POV.NAHC?locations=CO&view=map&year_high_desc=true`

[4]UNICEF global databases, 2019, DHS and *Nigeria – Multiple Indicator Cluster Surveys* (MICS).

effect of COVID-19, given the tendency of these incursions to target schoolchildren. We address this issue as a robustness check by providing estimates of the effect of COVID-19 using a subsample in which we exclude all observations from the North-East part of the country where these incursions are localized.[5]

We find that COVID-19's lockdown measures reduce children's school attendance probabilities by 6.94 percentage points after schools' reopening, and the result is highly statistically significant. Given that our descriptive statistics show age-based discrepancies in the proportions of children who went back to school after the school system's reopening, we break down our sample by age group, including the $5-11$ (primary school) and $12-18$ (secondary school or higher) age-groups. Estimation results show that the negative effect of COVID-19's lockdown measures on school attendance persists. We also find that the magnitude of this negative effect increases with age. For children aged $5-11$, the magnitude of this effect is 5.16 percentage points but rises to roughly 9 percentage points for children aged $12-18$. When we further restrict the estimation of this effect to the subsample of children aged $15-18$—those whose schooling is no longer compulsory—, and we find that its magnitude increases to 11 percentage points, implying that older schoolchildren are affected disproportionately by COVID-19's lockdown measures. Since schooling is no longer compulsory for children in the $15-18$ age group, this significant negative effect of COVID-19's lockdown measures will most likely be permanent. If no public policy measures are taken to reverse this permanent effect, it will have adverse consequences in terms of these children's earning prospects in the long run and the quality of the future economywide labor force.

We conduct various robustness checks to explore heterogeneity sources in this negative effect of COVID-19 on children's school attendance after the school system's reopening. This includes partitioning our sample by area of residence, by age group, and by region, restricting it only to children who attended school pre-COVID-19, and adding to the sample those not at school at the time of the survey, including respondents who are waiting for admission. We find that the negative effect of COVID-19 on school atten-

[5] Although the presence of Boko Haram in North-East Nigeria is one of the most important sources of insecurity, there are other types of conflict. However, our robustness analyses showed that the presence of Boko Haram is not an issue for our identification strategy; also, all our analyses control for individual fixed effects, and our period spans just 7 months (before schools' closure and after schools' reopening). Given these facts, we are confident that any other type of conflict would not significantly bias our results.

dance probability is robust to all these checks.

Importantly, given concerns in the literature that families' response strategies to the virus-induced income shock may take advantage of preexisting inequalities between boys and girls (Cousins, 2020), we also explore whether COVID-19's lockdown measures have a heterogeneous effect based on gender. Evidence from past epidemics shows that schoolgirls are at higher risk of dropping out and not returning to school after a health crisis (Archibong and Annan, 2019; Bandiera et al., 2020; Giannini and Albrectsen, 2020). In particular, Bandiera et al. (2020) find that schools' closure due to the Ebola pandemic in Sierra Leone increased teenage pregnancies and girls' school dropout two years after the eve of the pandemic. Their findings are confirmed five years after, showing long-term impacts of schools' closure on young girls. In a new report, UNICEF also warns that COVID-19 is likely to erase progress made on eliminating child marriage (UNICEF, 2021a).

When we consider the entire sample of schoolchildren, we find no statistically significant gender differences in the negative effect of COVID-19's lockdown measures on children's school attendance probabilities. Interestingly, when we interact lockdown measures with the gender of the respondent and the geopolitical zone, disparities emerge. In the North-West zone, estimation results show that COVID-19's lockdown measures disproportionately reduce girls' school attendance probabilities. In contrast, in the South-West zone, boys' school attendance is impacted disproportionately compared to girls. In the remaining four zones (North-East, North-Central, South-South, and South-East), there is no statistically significant gender effect of COVID-19.

We further explore which age groups drive the gender effects mentioned above. We find that, for the age group $5-11$ corresponding to primary school age, COVID-19's lockdown measures have no statistically significant impact on gender inequality. For the age group $12-18$, corresponding to secondary education or higher, we find that in the child marriage-prone North-West zone, these measures decrease girls' school attendance by roughly 10 percentage points relative to boys in the same age group. This result is consistent with evidence showing that in Nigeria, pre-COVID-19 education disparities across states were very high, with the North-West zone having the poorest education attainment for girls (DfID, 2012). Therefore, this result provides suggestive evidence that COVID-19's lockdown measures are likely to exacerbate child marriage where it is already prevalent.

Overall, our paper suggests that in settings where traditional practices conflicting with children's schooling (e.g., child labor and child marriage) are relatively common, COVID-19 and its induced disruption of education and economic activities can exacerbate under-investment in education. In particular, in settings where child marriage is highly prevalent, our study suggests that girls aged $12 - 18$ could become child brides because they are more likely to drop out of school due to the socioeconomic shock induced by COVID-19. As such, our study underscores the importance of safeguarding each girl's schooling access up to the age of 18, particularly in settings where child marriage is relatively common. Doing so may involve the implementation of income support or subsidy programs that can provide more options for households to increase food access and/or income.

Our paper contributes to the rapidly growing literature on the negative consequences of the COVID-19 pandemic on socioeconomic outcomes (Bevis and Barrett, 2020; Giannini and Albrectsen, 2020; Amare et al., 2021; Mahmud and Riley, 2021). However, in this literature, there has hardly been any formal attempt to quantify the impact of COVID-19 on the school attendance probabilities of children, particularly in a developing country context. Yet, given that developing countries are already lagging the rest of the world in human capital accumulation, COVID-19's lockdown measures present a massive challenge to these countries' education systems (Daniel, 2020). One of the reasons is that, unlike in developed countries, a sizeable majority of children in developing countries reside in rural areas, facing enormous barriers to distance learning activities (Dang et al., 2021). In addition, schools' disruptions endanger households' food security (Abay et al., 2021). Another reason is the lack of formal risk-management mechanisms in developing countries coupled with a breakdown of informal risk-sharing institutions in the face of covariate shocks such as pandemics (Kazianga and Udry, 2006; Fafchamps and Gubert, 2007). These three problems raise the stakes of quantifying the impact of COVID-19's lockdown measures on school attendance in developing countries. Our contribution to the literature on the consequences of COVID-19 is to fill this knowledge gap. In so doing, we show that the magnitude of the negative effect of lockdown measures induced by the COVID-19 pandemic increases with children's age. This negative impact is much more significant for children whose participation in schooling is no longer compulsory and, for this reason, is more likely to be permanent.

The rest of the paper is structured as follows. Section 2 presents the context, the data, and the measurement of variables. Section 3 discusses the empirical strategy and section 4 presents the results of the effect of the socioeconomic crisis induced by the COVID-19 pandemic. Finally, section 5 concludes.

2 Context, Data and Measurement of Variables

2.1 Context

Nigeria— the most populous country in Sub-Saharan Africa— is a federation of 36 states and 1 Federal Capital Territory (Abuja), distributed across six regions. The country is a setting of localized periodic natural hazards such as droughts and flooding. Additionally, it has been facing a decade-long security crisis in the North-East region in the form of frequent violent incursions by Boko Haram armed combatants. With the population aged 24 or less representing nearly 62% of its total population, Nigeria needs to harness its burgeoning youth's potential to boost economic development, reduce widespread poverty, and steer its youth away from ongoing religious and ethnic violence, either as victims or perpetrators.[6] Yet, despite being resource-rich, 40.09% of Nigeria's population still live in poverty (NBS, 2020). According to the 2020 edition of the UNDP's *Human Development Report* (UNDP, 2020), in 2019, Nigeria had a headcount of 46.40% for the population in multidimensional poverty, an internet use coverage of 42%, and a *Human Development Index* of 0.539— which puts the country in the low human development category, with a rank of 161 of 189 countries and territories.

In 2019, the mean number of completed years of schooling was 6.7, up from 5.2 in

[6] See the World Factbook, Nigeria, 2021. Accessed online on March 11th, 2020, at `https://www.cia.gov/the-world-factbook/countries/nigeria/`

2010—a gain of merely 1.5 years of schooling over nearly a decade (UNDP, 2020). Education and health —two essential constituents of an individual's human capital— have a combined contribution of nearly 60% to overall poverty deprivation in Nigeria, putting the country above the Sub-Saharan African region's average of 51.7%. Such under-investment in human capital raises concerns about the vulnerability of Nigeria's youth to harmful practices such as child labor and child marriage, known to be exacerbated by income shocks (Bertoni et al., 2019; UNICEF, 2021a,b).

(i) COVID-19 and Nigeria's Response

In 2020, Nigeria was one of the first African countries to report COVID-19 cases and was also among those who first experienced significant socioeconomic disruptions due to the pandemic (Amare et al., 2021). Social distancing, mobility restrictions, and temporary school closures were part of the federal and state-level governments' measures to contain the pandemic's spread. By mid-March 2020, all schools were closed along with land and air borders to all travelers (Ogundele, Ogundele; NCDC, NCDC). These measures restricted residents' movements and led to the closure of business operations and regional borders linking lockdown areas with the rest of the country.

All federal schools and some schools run by the states re-opened on October 12, 2020,[7] after a protracted closure of about 6 months. The aim of this paper is to study the impact of the COVID-19 lockdown measures on children's school attendance. Although Nigeria is among African country leaders in the use of mobile learning apps and tutoring sessions (Dang et al., 2021; Joseph-Raji and *et al.*, 2020), still, with an internet coverage of only 42% of the population, many children were left with no access to distance learning technology, in a context where the livelihoods of many families were disrupted by lockdown measures, thus potentially increasing their children's vulnerability to harmful practices.

(ii) Child Labor and Child Marriage in Nigeria

Concerns about the effect of temporary school closures due to COVID-19 stem from the fact that two harmful practices known to compete with children's schooling— namely,

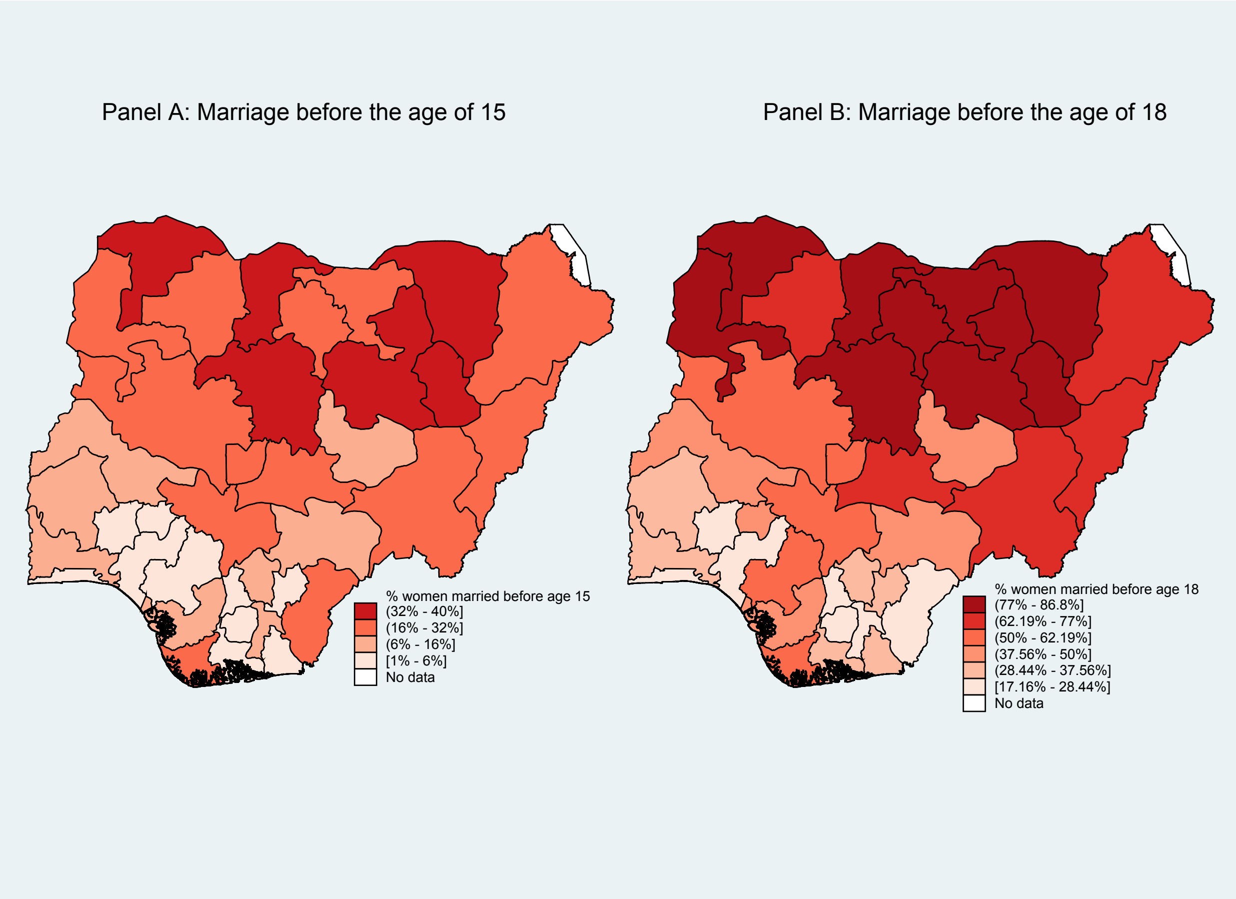
[7] urlhttps://www.reuters.com/article/health-coronavirus-nigeria-education-idUSL8N2GT2QV

child labor and child marriage— are still widespread and relatively common in Nigeria.

The International Labour Organization (ILO) defines child labor as work that deprives children under 18 of their childhood, their potential, and their dignity, and that is harmful to their physical and/or mental development. Data from the Multiple Indicator Cluster Survey (MICS) conducted in Nigeria in 2016 − 2017 indicate that the prevalence of child labor among children aged 5 − 17 was 50.8%, with 54.3% for boys and 47.2% for girls.

While child labor affects the school chances of both boys and girls, child marriage, in contrast, is a predominantly girls' phenomenon. It is defined as the marriage of a girl under 18 years of age. In the case of Nigeria, DHS data show a 43% prevalence of child marriage in among married women aged 20 – 24—which is 6 percentage points above Sub-Saharan Africa's average of 37%. Interestingly, Figure 1 built using Nigeria 2018 DHS shows significant regional disparities in the prevalence of child marriage both in terms of marriage before the age of 15 (Panel A) and marriage before the age of 18 (Panel B).

Figure 1: *Share of married women aged 20-24, who married before the age of 15 and 18, respectively, by state*



Notes*: This figure shows the proportion of married, women (or in cohabitation wit a man or have been married once) aged 20-24 who married before 15 (Panel A) and 18 (Panel B). The data source is the 2018 Nigerian DHS.*

Figure 1 reveals the existence of an internal child marriage belt along the Sahel part of the country stretching from North-West to North-East Nigeria. In particular, marriage before the age of 15 (Panel A), although still widespread country-wise, is more prevalent in Northern states, with rates ranging from 32% to 40%. Marriage before the age of 18 is much more widespread in Nigeria, as shown in Panel B. However, in this case as well, northern states are clearly more affected. In some areas, the prevalence rate is well above 80%—which is huge even by Sub-Saharan African standards. For example, despite not being directly affected by the security crisis involving *Boko Haram*, North-West Nigeria is among the heavily affected areas, both for less than 15 and 18 marriages.

Overall, Nigeria's figures in terms of both child labor and child marriage underscore the importance of schooling as a protective strategy for children against vulnerability to harmful practices known to undermine children's schooling outcomes (Edmonds, 2006; Field and Ambrus, 2008). It is against this background that we estimate the effect of temporary school closures due to COVID-19 on the school attendance of Nigerian children aged $5-18$.

2.2 Data and Measurement of Variables

In this section, we present the data, the construction of relevant variables, and summary statistics.

2.2.1 Data

This paper uses data from the Nigeria COVID-19 National Longitudinal Phone Survey (COVID-19 NLPS), implemented by the National Bureau of Statistics of Nigeria with support from the World Bank. The COVID-19 NLPS collects monthly data to monitor the socioeconomic effects of the evolving COVID-19 pandemic in nearly real time. The sample of the COVID-19 NLPS is a subsample of households that had been interviewed face-to-face prior to the COVID-19 pandemic as part of the Nigeria General Household Survey (GHS) - Panel 2018/19, designed to be representative at the national level as well as at the zonal level. Linking the near real time information of the COVID-19 NLPS data with the very extensive set of information collected just over a year prior to the pandemic in the GHS - Panel 2018/19 (January/February 2019) allows exploring heterogeneous effects of school closure on school attendance.

The study selected 3,000 households from the frame of 4,934 households with a phone number contact for at least one household member or a reference individual. Of these, 1,950 households were successfully interviewed in Round 1 of the COVID-19 NLPS and the same households were called about every four weeks for the subsequent round interviews. Excluding from the final sample households with no access to a mobile phone and that could not be interviewed despite several call attempts may introduce a potential bias in the selection of the sampled households. To overcome this potential bias and obtain statistics representative at the national level, a balanced sampling approach was adopted, leveraging on the extensive set of variables available in the Nigeria General Household Survey (GHS)-Panel 2018/19. Additionally, this study uses the publicly available phone survey weights, calculated by adjusting the GHS-Panel 2018/19 household weights to reflect the selection and interviewing process and calibrated according to the characteristics of the weighted sample included in the GHS-Panel 2018/19.

This study mainly relies on the information included in Round 6 of the COVID-19 NLPS. This survey round includes information at the individual level on school attendance and other education variables for household members aged 5-18.[8] A maximum of 6 household members were randomly selected for each household to limit the respondents' burden, with a final sample of 4,006 members 5-18 aged of 4,325 eligible individuals (of the 1,762 households successfully interviewed in Round 6). Given the selection process of individuals aged 5-18 years, individual-level weights were calculated and calibrated to correspond to the sex and age distribution of the total weighted population aged 5-18 years as included in the GHS-Panel 2018/19.[9]

2.2.2 Measuring School Attendance

To measure children's school attendance just before the school closure and just after school reopening, we take advantage of the COVID-19 round 6 phone survey which, unlike previous rounds where schooling information was measured at the household level, provides information on schooling at the individual level for children aged 5-18.

In the survey, after schools reopened in Nigeria in October 2020, respondents were asked whether they were attending school at the moment of the survey either in person or remotely. Hence, we define school attendance after school reopening as a binary variable taking the value one if the individual answered "Yes" to this question, and zero

[8]Primary education starting age is 6 years although it is common to start primary education at 5 years.

[9]See McGee et al. (2020) for a detailed explanation of the methodology adopted for calculating household and individual level weights.

otherwise. However, among those individuals who indicated not attending school at the time of the survey, some of them attributed their status to the fact that (i) their schools were still closed due to COVID-19 (864 of 1,538), or (ii) because they were still on holiday (9 of 1,538), or (iii) they were afraid of contracting the COVID-19 (1 of 1,538), or (iv) they were waiting for admission (195 of 1,538).[10] As a result, for the baseline model, we exclude individuals who attributed their non-attendance to (i), (ii), (iii), or (iv). However, for the robustness analysis, we include these children (see Table 12). Since individuals (i), (ii), or (iii) were not attending school after school reopened for the reasons we mentioned above, they were asked in the survey whether they planned to attend school after their school reopen, after holidays, or after the coronavirus situation gets better. Children who answered "Yes" to this question are considered attending school after school reopening, otherwise, they were considered not attending school. For respondents (iv), respondents who were waiting for admission after school reopening, we assume that those who were in school before COVID-19 will all resume classes.

To measure pre-COVID-19 school attendance, we combine responses to the following questions: whether (i) the respondent attended school at any time during the school year 2019-2020, or (ii) the respondent attended classes on-site or remotely since schools reopened in October 2020, or (iii) at the time of the survey the respondent attended school during the academic year 2020-2021. Questions (ii) and (iii) are relevant because an individual who attends school after the temporary closure due to COVID-19 is lifted must have attended school pre-COVID-19.[11] Based on the answers to these questions, we define pre-COVID-19 school attendance as a binary variable taking the value 1 if individuals answered "Yes" to either of the three questions described above and 0 if otherwise.

[10] Table 13 presents the reasons given by children who were not attending school in 2020 after the schools reopened.

[11] The question on whether the respondent attended a class during academic year 2019-2020 was submitted to all respondents except those who replied (i) they resumed classes after the schools reopened, and (ii) were not attending a class for academic year 2020-2021. Since they were not attending academic year 2020-2021 classes, they must necessarily only attend academic year 2019-2020, which was not yet ended for some students at the time of the survey.

2.2.2.1 Comparability of School Attendance before COVID-19 and during COVID-19 after School Reopening

School attendance after school reopening was measured in October 2020, when school participation is expected to be the highest in the school year. School attendance before school closure is defined based on attendance at any time during the academic year 2019-2020. Therefore, we are fairly confident that school attendance before and after the outbreak of the pandemic is comparable. Nonetheless, because the reference period used to measure school attendance before and during COVID-19 is different, we explore further the comparability of our measure of school attendance between the two periods (before and during COVID-19). For example, during the agricultural period, households might withdraw their children from school to help with household farming. However, in mining the reasons for not attending school given by respondents in the COVID-19 NLPS round 6, no respondent mentioned employment as a reason. Furthermore, respondents might not attend school because they are waiting for admission. Therefore, in robustness analyses, we assume that these respondents attended school when the schools reopened (in October 2020). These results are consistent with those from our main specification.

2.2.3 Lockdown Indicators

On March 19, 2020, a circular from the Federal Ministry of Education ratified the closure of all schools in Nigeria starting from March 23, 2020. At the same time, as described in Section 2.1, the federal government implemented various social distancing and mobility restrictions, and decided for the closure of business operations and regional borders. We define the baseline COVID-19 lockdown measures (labeled as *C19Shock* in our specifications below) as a binary variable taking value one for the period after the outbreak of the pandemic and the implementation of the above-mentioned restriction measures, zero otherwise.

In addition to these interventions, the federal and state governments implemented additional lockdown measures and strict mobility restrictions in Abuja FCT, Lagos, Akwa Ibom, Borno, Osun, Rivers, Ogun, Kano, Delta, Ekiti, Kano, Kaduna, Kwara, and Taraba states. In most cases, these lockdown measures were in force for about 5-8 weeks, and 're-stricted the movement of residents and led to the closure of business operations, and the closure of regional borders linking lockdown areas with the rest of the country.' (Amare et al. (2021), pp. 6-7). As shown in Amare et al. (2021), in addition to the effects caused by the nationwide restrictions, the above-mentioned state-level lockdown measures also had an adverse impact on affected households' well-being. Therefore, school-age children living in states affected by these additional measures are expected to show a higher risk of school drop-out. To test for this hypothesis, we followed Amare et al. (2021) by constructing an indicator for such augmented lockdown measures (labeled as *AugmLockdown* in our specifications below), which takes value one if the person lives in the states reported above, and zero otherwise.

2.2.4 Measuring Climate Shocks: Drought and Flood

Households' livelihoods and decision to invest in children's education may be affected by the concomitant occurrence of climate shocks. Given that Nigeria is partially located in the drought-prone western Sahel region, such events are quite regular. As documented by the reports of the International Federation of the Red Cross and Red Crescent Societies (IFRC),[12] some states in Nigeria were severely hit by floods in September 2019 and October 2020. If a drought or flood occurs simultaneously with COVID-19 outbreak and its related lockdown measures, such shocks may confound the true impact of temporary school closure due to COVID-19 on school attendance. Therefore, we control for drought and flood events in all our estimations.

We measure drought in 2019 (before the outbreak of COVID-19 pandemic and school closure) and 2020 (during COVID-19 and before school reopening) using the Standardised Precipitation-Evapotranspiration Index (SPEI), which captures the severity of drought according to its intensity and duration.[13] Since the lean period in Nigeria covers the period from April to August,[14] we calculate the average SPEI index between April and

[12] https://adore.ifrc.org/Download.aspx?FileId=261150 and https://adore.ifrc.org/Download.aspx?FileId=352740

[13] SPEI data are available at https://spei.csic.es/

[14] http://www.fao.org/giews/countrybrief/country.jsp?code=NGA

August (which corresponds to the agricultural season for most crops grown in Nigeria) in 2019 and 2020. We then merge these data with the anonymized GPS coordinates with a random offset of the Enumeration Areas (EAs) where individuals reside, as provided in the public use GHS-Panel 2018/19 datasets.[15] Thus, following Vicente-Serrano et al. (2010), individuals are affected by drought when they reside in an EAs whose SPEI is less than -1. Finally, we used the reports by IFRC to define flood disaster. Specifically, our flood measure takes the value 1 when the individual resides in the states affected by flood and 0 otherwise.

2.2.5 Summary Statistics

Table 1 displays summary statistics of the sample we use for the main analysis. This sample includes children aged $5-18$ years, and we exclude the respondents for whom the schools are still closed at the time of the survey in October 2020, those who are still on leave or refuse to go to school because they are afraid of contracting the coronavirus and those who are waiting for admission. This table indicates that 90% of children attended school before the schools' closure compared to 82%, who are attending school during COVID-19, i.e. after the schools reopen in 2020.

In 2019, the average age of respondents in the sample is 9.92, and they are mostly the children of the household head (83%). Among the household heads, 41% have never been to school. The average household size is approximately 9. Slightly less than half of the individuals in the sample are girls (48%), and it is observed that 74% of the respondents live in rural areas. More than half (52%) of the individuals have been in contact with their teachers during the school closure period. Individuals were more affected by drought in 2019 than in 2020. Specifically, 56% of respondents were affected by the drought in 2019, compared to 41% in 2020. About half of the respondents (47%) for whom

[15] Given that the COVID-19 NLPS phone survey does not provide the updated GPS coordinates of EAs where interviewed households' reside, we hypothesize that households interviewed in October 2020 reside in the same locality as in 2018/19. To test this assumption, we assess the households' mobility for the previous rounds of the GHS survey. Of households surveyed, 93.7% in both the GHS - Panel 2015/16 and the GHS Panel 2018/19 have not changed location a 3-year interval, while 6.97% of households have moved within the same locality, close to the original location. This evidence, along with the context of COVID-19, which led the government to impose certain restrictions, reinforces the assumption that it is unlikely that households have moved from their original location in 2020.

we observe employment status worked during the lockdown.

Figure 2 shows how school attendance varies by age, gender, and area of residence before and after schools reopened in Nigeria. Panel A shows how school attendance varies by age, before and after school reopened during COVID-19. It shows that up to the age of $11-12$, children's school attendance increases with age, while the reverse direction is observed among children aged 12-18 years - suggesting higher dropout rates for children in this age group. Interestingly, a comparative analysis of school attendance before and during COVID-19, shows that the dropout rate just after schools reopen increases with children age - suggesting that older schoolchildren are more affected by the socioeconomic crisis due to COVID-19 than younger.

Panel B and C respectively show how children's school attendance varies with age by gender before COVID-19 and after schools reopened during COVID-19.
A closer look at these two graphs shows that before COVID-19 or after schools' reopening during COVID-19, the proportion of boys under 7 years old attending school is slightly higher than the corresponding proportion of girls attending school. No gender differences in schooling are observed among children aged $7-14$. This might be explained by the fact that schooling is mandatory for this age group in Nigeria. However, for children aged $15-18$ —whose school attendance is not compulsory in Nigeria—, these graphs show that before COVID-19, girls' school dropout rate is higher than boys, indicating the existence of gender inequality pre-COVID-19 for this age group. However, after schools' reopening, the pre-COVID-19 gender inequality appears to be narrowing.

Unlike Panel A, which presents school attendance by age for all girls and boys in our sample, Panels D and E present how school attendance varies with age, before COVID-19 outbreak and after school reopened in October 2020, for girls and boys respectively. By analyzing these graphs, it emerges that, whether for girls (Panel D) or boys (Panel E), COVID-19 seems to increase children's dropout from school as their age increases - suggesting that the effect of COVID-19 on school attendance increases with age - thus justifying the results of Panel A.

Panel F displays how school attendance varies with age based on the children's area of residence (Urban vs. Rural), before COVID-19, and after schools reopened during

COVID-19. Before COVID-19, children living in urban areas and under the age of 15 are more likely to attend school than children living in rural areas that have the same age. From the age of 15 onward, no difference in school attendance is observed between urban and rural children. After schools reopened, i.e., during COVID-19, no difference is observed between urban and rural children, although before the age of 15, urban residents are more still likely to attend school than rural residents.

Overall, Figure 2 suggests that COVID-19 decreased school attendance among all age groups, but even more so, among those whose education is no longer compulsory (age-group 15-18). Figure 2 also suggests that COVID-19 did not discriminate between the genders or between rural and urban children.

2.2.6 Learning Activities and Contact with Teachers during the School-Closure Period

In the analysis of the heterogeneous effects, we are interested in whether the impact of temporary schools' closure on attendance differs by the opportunity of being engaged in any learning activities or in contact with their teachers during the school closure period in Nigeria. We hypothesize that people who were engaged in any learning activities during the lockdown are more likely to return to school than those who were not. Indeed, losing contact with the education system over the whole period of schools' disruption is expected to lower students' motivation to schooling by making other options (like employment and marriage) more attracting alternatives.

(i) Learning Activities

To capture learning activities during the school closure period, we exploit the first five rounds of the COVID-19 NLPS in Nigeria, using the question asking if children have been engaged in any education or learning activities during the seven days preceding each round survey.[16] Therefore, we construct a dummy variable equal to 1 if a child resides in a household where children have been engaged in these types of activities in

[16]The question was asked in each of the first five rounds of the COVID-19 NLPS that took place between May and September (during the temporary closure of schools to households) to households with children in either primary or secondary school and aged $5-20$.

any of the first five rounds of the phone survey preceding Round 6, and 0 otherwise.

(ii) Contact with Their Teacher

To define the contact between students and their teacher, we use the question asking whether children or anyone else in the household were in touch with their teacher - a question that was asked only in Round 1, Round 2, and Round 5 of the Nigeria COVID-19 NLPS. We generate a binary variable equal to 1 for an individual residing in a household who answered "Yes" to this question in any of the survey Rounds for which the question was asked, and 0 otherwise. Table 1 shows that 52% of students have been in contact with teachers during the period of protracted schools' closure.

2.2.7 COVID-19 and the Opportunity Cost of Schooling

Central to this study is the hypothesis that lockdown measures induced by the outbreak of COVID-19 undermine children's school resilience. Nigeria offers an excellent context for testing this hypothesis because according to UNICEF's 2013 estimates, in absolute value, one in every five of the world's out-of-school children lives in Nigeria. Moreover, various factors inherent to the country's socioeconomic fabric drive education deprivation, including geography, poverty and socio-cultural norms and practices that discourage attendance in formal education, especially for girls.[17] This multiplicity of potential factors raises the challenge of identifying the impact of COVID-19 on school resilience.

Descriptive statistics presented in Table 8 show the impact of COVID-19 lockdown measures on proxies/determinants of the opportunity cost of schooling to parents. We built this table using survey respondents' answers to various questions about household socioeconomic conditions contained in the 2020 COVID-19 NLPS phone surveys. For example, in the COVID-19 NLPS round 4 conducted in August 2020, households were asked to compare their current income from various sources to their income in August 2019, and to indicate whether these incomes had increased, decreased, or remained the same.

[17]See UNICEF Nigeria, 2013. Education. Available online at `https://www.unicef.org/nigeria/education`

As shown in Table 8, a large majority of surveyed households (66.44%) reported a decrease in their income in August 2020 compared to August 2019. This figure was highest among households with an off-farm family business (61.82%), followed by those employed in agriculture (55.5%). Importantly, our computations indicate that two-thirds of children in our analysis sample come from households whose total income declined after the COVID-19 outbreak. Such reductions in income are mostly due to the loss of employment due to COVID-19. Indeed, while 82.27% of household heads had a job in January/February 2019 (i.e., before COVID-19), only 41% were working in April/May 2020, although, by June 2020, this figure to 72% after some of the restrictions imposed by the government were lifted.[18] The above descriptive statistics are consistent with evidence showing that COVID-19's lockdown measures imposed by the Nigerian government worsened households' living conditions (Andam et al., 2020) and increased food (Amare et al., 2021). In a sociocultural context where participation in economic activity still puts a competing claim on children's time, these descriptive statistics suggest that lockdown measures increased parents' opportunity cost of sending their children to school after schools' reopening.

In addition, food insecurity is an important determinant of school attendance (Jyoti et al. (2005), Frongillo et al. (2006)). Hence, if COVID-19 increases household food insecurity, fewer children would be expected to attend school after schools' reopening, unless there are provided with in-school meals. Indeed, using the main sample, our computation indicate that the proportion of children affected by moderate food insecurity increased by 44 percentage points, from 21% in 2019 to 75% in August 2020 during COVID-19 (see Table 1). Furthermore, information collected for these same households in October 2020 confirms that a large majority of children live in households that reported not having eaten various types of food during the 7 days before the survey (see Table 9). This indicates a high prevalence of food insecurity following the COVID-19 outbreak.

Overall, given the high private cost of education (especially for the poor) and the continued tolerance of child labor in Nigeria, the COVID-19-induced negative income shock is likely to increase the economic value of children to parents (through child labor and/or

[18]We compute these statistics based on the sample used in our main specification (see section 2.2.6 for more details).

child marriage) as a struggle to survive (Thomas et al. (2004), Kruger (2007)). These predictions are consistent with findings by Duryea et al. (2007) showing that, in Brazil, an income shock that affected household heads increased not only children's participation in labor markets but also children's school dropout.

3 Empirical Strategy

To identify the impact of COVID-19 on school participation, we draw from Mahmud and Riley (2021) in estimating the following individual fixed-effect linear probability model:

$$SchoolAtt_{iat} = \alpha_0 C19Shock_t + \alpha_1 CS_{at} + \alpha_2 HHsize_{it} + \alpha_3 Age_{it} + \rho_i + \epsilon_{iat} \quad (1)$$

where $SchoolAtt_{iat}$ measures the school attendance status of a schoolchild i living in the Local Government area (LGA) a, at time t. By convention, t equals zero in the pre-COVID-19 period (*i.e.*, academic year 2019-2020, before the protracted schools closure due to the pandemic) and one in the period following schools' re-opening (*i.e.*, when schools re-opened on October 12th, 2020[19]). The coefficient of interest is α_0, which captures the immediate effect of COVID-19's federal lockdown measures in Nigeria $C19Shock_t$ on school attendance. $C19Shock_t$ is defined as a binary variable equals to 1 for the COVID-19 period (when schools re-opened) and 0 for the pre-COVID-19 period (before the implementation of lockdown measures, including schools' closure).

However, there may be concerns that α_0 may also be capturing the occurrence of any other time variant event (e.g., the occurrence of a *Boko Haram* incursion in a given geographic area, climate shocks such as droughts or floods) or a household shock that occurred between time zero and time one and that may affect the school attendance decision.

To account for the potential confounding effect of *Boko Haram* in particular, as a robustness check, we estimate equation (1) by dropping from our sample all observations

[19] When schools re-opened, individuals may be enrolled either in academic year 2019-2020 or 2020-2021.

from the North-East area where *Boko Haram* is known to be active. This includes the semi-autonomous States of Adamawa, Bauchi, Borno, Gombe, Taraba, and Yobe (Bertoni et al., 2019). To account for other confounding time variant factors, such as climate shocks, and household idiosyncratic shocks, we control for CS_{at} and $HHsize_{it}$, which represent the occurrence of climate shocks (drought and flood) and the household size, respectively. In addition, we add the age fixed effect vector Age_i to control for age-specific school enrollment trends. Given that observations are likely to be clustered within the same region, standard errors are clustered at the Local Government Areas (LGAs) level. In our baseline sample, we identify 342 LGAs in Nigeria.

Therefore, upon controlling for schoolchildren's fixed-effects (ρ_i) and the exposure to pre- and post-COVID-19 climate shocks like drought and flood, our identification strategy relies on the exogenous occurrence of the pandemic in $t = 1$. Indeed, a negative climate shock would affect household income that, in turn, may push parents to withdraw their children from school. If the occurrence of such shocks is also correlated with $C19Shock_t$, then α_0 would not correctly estimate the causal effect of COVID-19-related schools' closure on enrollment. In addition, the identification is more credible by the short time horizon over which the change in school attendance is observed, *i.e.*, just before schools' closure and just after schools' reopening. By observing schoolchildren over only two periods, the estimates we obtain using individual fixed effects are identical to those that would be obtained with the first difference approach. Although α_0 measures the immediate effect of schools' closure on school attendance, it is quite unlikely that children who dropped out of school because of the pandemic will return to school after a longer term. This is especially the case at for the 15-18 years old, when school attendance is no longer mandatory.[20]

We estimate Equation 1 on all schoolchildren aged between 5 and 18. However, to estimate whether the pandemic has an heterogeneous effect across the population, we also run Equation 1 by different age groups, namely $5-11$, $12-18$ and $15-18$, that captures the primary, secondary and higher-secondary school levels, respectively. In addition, we re-run Equation 1 by interacting $C19Shock_t$ by various individual and household binary characteristics X_{ia}:

[20] https://mastercardfdn.org/the-impact-of-covid-19-on-secondary-education-in-africa/

$$SchoolAtt_{iat} = \alpha_0 C19Shock_t + \alpha_1 C19Shock_t \times X_{ia} + \gamma_1 CS_{at} + \gamma_2 HHsize_{it} + \gamma_3 Age_{it} + \rho_i + \epsilon_{iat} \quad (2)$$

where α_1 estimates differential effects of the COVID-19's lockdown measures for an individual with characteristics X_{ia}. X_{ia} can represent the gender of the schoolchild, the urban or rural sector of residence, whether the State of residence has been hit by a more severe lockdown (as defined in Section 2.1) during the first round of the pandemic between March and June, whether a schoolchild has benefited from distance learning during the lockdown period.

To identify the heterogeneous effects of the impact of COVID-19 by gender and zone, we estimate Equation 1 for all age groups (5-18, 5-11, and 12-18) through the following model where we interact the variable $C19Shock_t$ with gender and area of residence of respondents.

$$\begin{aligned} SchoolAtt_{iat} = {} & \alpha_0 C19Shock_t + \alpha_1 C19Shock_t \times Girls_i + \alpha_2 C19Shock_t \times Zone_i \\ & + \alpha_3 C19Shock_t \times Girls_i \times Zone_i + \gamma_1 CS_{at} + \gamma_2 HHsize_{it} + \gamma_3 Age_{it} + \rho_i + \epsilon_{iat} \end{aligned} \quad (3)$$

Where $Girls_i$ measures the gender of the respondent and takes the value 1 if the respondent is a girl and 0 otherwise. The variable $Zone_i$ which captures the geopolitical zone of residence of the individual is a dummy variable which takes the value 1 according to the zone that is highlighted in the model.[21] The other undefined variables of this Equation have the same meanings as those given in Equation 1.

The sum of the coefficients α_0, α_1, α_2, and α_3 capture the impact of COVID-19 on girls' school attendance living in zone i, while the sum of the coefficients α_0 and α_2 capture the impact of COVID-19 on boy school attendance in the same zone.

Data from phone surveys may suffer more than usual face-to-face surveys of measurement errors. Given that our school attendance variable pre- and post-COVID-19 is

[21] Nigeria is subdivided into 6 geopolitical zones, namely North-Central, North-East, North-West, South-East, South-South, and South-West.

observed in the phone survey dataset, such potential bias is addressed by controlling for the individual effect ρ_i also captures. Also, using only the phone survey data set, we do not face issues of attrition bias. Estimates are all weighted by the sampling weights provided with the phone survey to infer results at the national population level.

4 Results

In this section, we discuss the results of the estimation of the effect of COVID-19's lockdown measures on school attendance after the school system's re-opening. For convenience, in the rest of the paper, we refer to this effect as the COVID-19 effect.

(i) Baseline Results

Table 2 displays our baseline estimations' results. Panel A displays the results for all respondents aged 5-18 years old. We find that COVID-19's lockdown measures reduce school attendance by 6.94 percentage points after the school system's reopening, and the result is highly statistically significant (Panel A, column 1). Moreover, when we interact the nation-wide lockdown measures with state-specific measures, we find that the severity of the lockdown measures which accompanied schools' closure has no statistically significant effect on children's school attendance probability after reopening (Panel A, column 2). These results suggest that the severity of lockdown measures did not make a difference in children's school attendance probabilities. One possible reason for this result may be a low compliance with these measures, particularly non-binding measures. For example, Bargain and Aminjonov (2021) in a study of several developing countries find that work-related mobility during the first lockdown period was higher among the poor than the non-poor. Additionally, we find no statistically significant differences in the effects of COVID-19's lockdown measures between rural and urban areas (Panel A, column 3). This finding suggests that the socioeconomic crisis due to COVID-19's lockdown measures did not disproportionately affect children based on their area of residence.

When we break down the above results by age group, we find that schoolchildren aged $5-11$ were not spared by the negative effect of COVID-19's lockdown measures, despite the fact that, by law in Nigeria, school attendance is compulsory for this age group. Indeed, we find that among children in this age group, COVID-19's lockdown measures reduce school attendance by 5.16 percentage points, which is only 1.78 percentage points lower than the effect obtained in the whole sample. Again, neither the severity of lockdown measures, nor the area of residence has a statistically significant effect on the school attendance probabilities of children in this age group.

Next, we turn to children in the age group $12-18$ corresponding to secondary education or higher. We find that among these children, COVID-19's lockdown measures reduce school attendance by 8.64 percentage points, and the result is highly statistically significant (Panel C, column 1). This result indicates that age is a significant factor in how households' school attendance decisions respond to COVID-19's lockdown measures. Households are more likely to pull older children out of school than their younger ones. Just like in the case of the $5-11$ age-group subsample, we find that for the $12-18$ age group, neither the severity of lockdown measures, nor the area of residence has a statistically significant effect on school attendance.

When we further restrict our baseline sample to include only those in the age group $15-18$—for which schooling is no longer compulsory in Nigeria—, we find an even starker reality (Panel D). The magnitude of the negative effect of COVID-19's lockdown measures on school attendance balloons to 11.1 percentage points (Panel D, column 1), which nearly double the magnitude of the effect obtained using the baseline sample ($5-18$ years old children). This result is highly statistically significant, and confirms age as a determining factor in how parents' school attendance decisions respond to COVID-19's lockdown measures. It suggests that Nigerian families disproportionately discontinued the school attendance of those of their children whose school attendance is no longer compulsory. However, even in this case, the result is not influenced at all by the area of residence, or the severity of lockdown measures.

(ii) Did COVID-19 Impact the Gender Gap in School Attendance?

To address this question, we partition our sample by gender. This enables us to capture the fact that baseline characteristics may differ by gender. We investigate whether

COVID-19 lockdown measures disproportionately impacted the school attendance probabilities of children based on gender. Results of these estimations are reported in Table 3 reports the results of this estimation. First, when we consider the entire sample of children (Table 3, Panel A), we find that neither gender was spared by the socioeconomic impact of COVID-19's lockdown measures. These measures reduce the school attendance probabilities of boys and girls. Although this negative impact appears slightly more substantial in magnitude for boys than for girls, the resulting gender difference, however, is not statistically significant. This implies that over the whole sample, COVID-19's lockdown measures have no statistically significant effect on the gender gap in school attendance.

When we partition our sample by gender and by age group, we find that the above conclusion holds for all age groups, including the age groups $5-11$ corresponding to primary school age (Panel B), $12-18$ corresponding to secondary school or higher (Panel C), and children aged $15-18$—whose schooling is no longer compulsory in Nigeria—(Panel D). This result suggests that COVID-19's lockdown measures have no statistically significant effect on gender inequality in school attendance in Nigeria.

We further explore the joint heterogeneity of gender and geopolitical zones. Given the non-representativeness of the COVID-19 NLPS data at the zonal level, we explore the gender effect by interacting COVID-19's lockdown measures with the child's gender and her geopolitical zone. We find that COVID-19 shock significantly increases gender inequalities in school attendance in the North-West and South-West zones (Table 4, Panel A). Surprisingly, in South-West Nigeria, we find that COVID-19's lockdown measures reduce the gender gap in school attendance by roughly 4.32 percentage points. Specifically, the COVID-19's lockdown measure reduces school attendance for girls living in the South West zone by 3.28 percentage points, while the reduction is 7.61 percentage points for boys living in the same zone. In contrast, in North-West Nigeria— which is one of the regions most affected by child marriage— we find that COVID-19's lockdown measures increase the gender gap favoring boys in school attendance by 9.15 percentage points. While COVID-19 significantly reduces the school attendance of girls in the North-West zone by 10.89 percentage points, there is no effect on the school attendance of boys in this zone.

When we further analyze by age group, we find that in South-West Nigeria, the decrease in the gender gap favoring girls in school attendance is essentially driven by the age group $12-18$ (Table 4, Panel B, column 6, and Table 5, Panel C). In North-West Nigeria, the increase in the gender gap favoring boys in school attendance is also driven by the age group $12-18$ (Table 4, Panel C, column 3, and Table 5, Panel C). For this age group, we find that the COVID-19 lockdown measures decrease the school attendance of girls by roughly 10 percentage points relative to boys in the same age group. Given that North-West Nigeria is one of the regions where child marriage is most prevalent, this result provides suggestive evidence that child marriage in this region may increase due to COVID-19 lockdown measures.

4.1 Robustness Checks

Here, we report the results of several checks. First, our baseline results are obtained using the full sample of school-age children, some of which did not attend school prior to the inception of COVID-19 measures. We therefore check the robustness of our results by re-estimating the effect of COVID-19 on school attendance using a subsample that includes only children who attended school prior to the pandemic. This new specification also enables us to include, in the regression equation, the interaction of our COVID-19's lockdown measures variable with access to distance learning and contact with a teacher, respectively. The survey questions from which these variables built were administered only to households with at least one child (aged $5-20$) who attended school prior to the inception of lockdown measures. The results of this estimation are reported in Table 6. Our results remain unchanged compared to the baseline results reported in Table 2, albeit with a slightly stronger magnitude.

Second, we also re-estimate the effect of COVID-19 on the gender gap in school attendance using the subsample of school-age children who attended school pre-COVID-19. Results of this estimation are reported in Table 7. We find that among primary school-age children (Panel A), COVID-19 has no statistically significant effect on the gender gap in school attendance. In contrast, among children aged $12-18$ (Panel B) and those age $15-18$—whose schooling is no longer compulsory in Nigeria— (Panel C), we find that the interaction of COVID-19 with having contact with a teacher during schools' closure increases the gender gap favoring boys in school attendance. This result is similar to the one reported in Table 3, and can be explained by the fact that school attendance is no longer compulsory for children in this age group. It shows that secondary school is a critical period for a girl, during which her probability of dropping out of school rises substantially compared to boys of the same age group. This is particularly the case in settings where child marriage remains common practice.

Next, we examine the robustness of the baseline results to the exclusion from our sample of all geographic units affected by *Boko Haram* periodic violent insurrections that disrupt children's school attendance. This includes the entire North-East region. In so doing, our baseline sample size drops to $2,237$ individuals, a loss of 699 individuals. The results of this estimation are reported in Table 10. We find that our results not only remain unchanged, but have similar magnitudes when compared to the baseline results.

As discussed in Section 2.2.2, from our baseline estimations, we excluded 864 individuals whose schools were still closed at the time of the survey, 9 who were still on holidays, one (1) child who did not attend school because of fear of contracting the COVID-19, and 195 individuals who were waiting for admission during the survey period. Among respondents whose schools are still closed due to the coronavirus or holidays, as well as the respondent who is afraid of contracting the coronavirus, 870 affirmed that they were planning to go back to school as soon as schools would have reopened, or after the holidays, or after the health situation got better. For respondents who said during the survey period they were waiting for admission, we hypothesize that those among them who were attending school before the schools closed are more likely to return to school after the schools reopen. As such, we assume in this robustness analysis that they all attend school. Table 11 shows that individuals whose schools had not yet reopened by the time of the survey and those that are waiting for admission have 3 percentage points more chances of attending school. This evidence motivates our interest of testing whether the inclusion of these individuals would affect our baseline results. Table 12 show that the estimation results when these individuals are added to the sample used in the baseline specifications. We then compare these tables to table 2. Although the magnitude of the coefficients decreased slightly with this inclusion, these results are close to the baseline coefficients. This confirms the robustness of our results.

Finally, since the employment status of the household head and the food insecurity status vary between before and during COVID-19 periods and could influence children's school attendance, we added these two variables as controls to the baseline specification. The obtained results are consistent with our main findings (results are not shown, but available upon request).

5 Conclusion

This paper provides some of the first evidence in a developing country context that the COVID-19 lockdown measures undermine children's school resilience after the school system's reopening. We obtain this evidence by using a unique dataset from Nigeria to estimate the effect of the COVID-19 lockdown measures on children's school attendance probabilities. We find that the COVID-19 lockdown measures reduce children's school attendance all across Nigeria. Importantly, our results show that the magnitude of this negative effect of the COVID-19 lockdown measures increases with children's age. In particular, this negative effect is largest among children aged $15-18$—those for whom schooling is no longer free and compulsory in Nigeria. It suggests that when hit by a shock, families disproportionately discontinue the school attendance of those of their children for which education is not compulsory. For these children, therefore, the negative effect of the COVID-19 lockdown measures on school attendance is likely permanent, leading to school dropout. We also find that, among children aged $12-18$ in the child marriage-prone North-West Nigeria, the COVID-19 lockdown measures increase gender inequality favoring boys in school attendance, thus increasing girls' risk of becoming child brides.

We take the above results as suggestive evidence that in countries where cultural practices harmful to children are relatively common, the COVID-19 lockdown measures are likely to exacerbate children's vulnerability to these practices. The main reason for this is that the economic consequences of these lockdown measures disproportionately reduce the school attendance probability of older children whose schooling is no longer compulsory, as is the case for children aged $15-18$ in Nigeria. In particular, the disproportionate negative impact of the COVID-19 lockdown measures on adolescent girls' school attendance in child marriage-prone settings implies that if nothing is done to reverse it, these girls will become child brides, with adverse consequences for the completion of several sustainable development goals. Our paper, therefore, suggests that public policies to mitigate the adverse socioeconomic impact of COVID-19 should target the school resilience of adolescent girls in settings where child marriage is relatively common. This could involve the implementation of income support or subsidy programs that can provide more options for households to increase food access and/or income.

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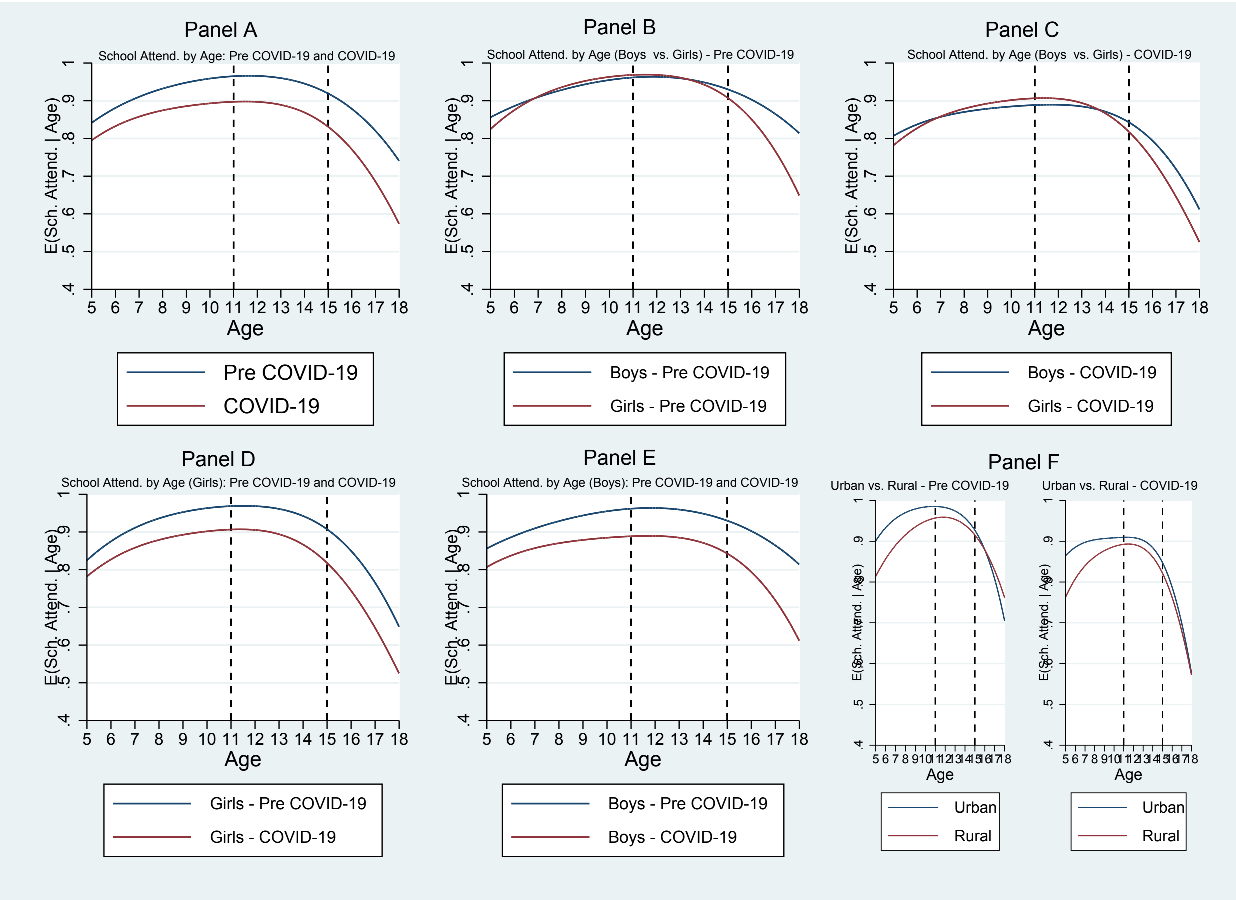
Table 1: Descriptive statistics of the outcome variable (school attendance) and all control variables, before schools' closure and after schools' reopening

	Mean (2019) Pre COVID-19	Mean (2020) COVID-19	Obs
School attendance[a]	0.90	0.82	2,936
	(0.30)	(0.38)	
Age[a]	9.92	10.92	2,936
	(3.79)	(0.01)	
Child of the HH head[a]		0.83	2,936
		(0.37)	
HH head never been to school[b]	0.41		2,936
	(0.49)		
Household size	9.09[c]	9.60[a]	2,936
	(4.86)	(4.86)	
Gender (Girl)[a]	0.48	0.48	2,936
	(0.50)	(0.50)	
Sector (Rural)[b]	0.74		2,936
	(0.44)		
Moderate food insecurity	0.31[b]	0.75[a]	2936 (2881)
	(0.46)	(0.43)	
AugmLockdown		0.56	2,936
		(0.50)	
Engaged in any learning activities[d]		0.85	2,936
		(0.36)	
Contact with teachers[d]		0.52	2,936
		(0.50)	
Drought[e]	0.56	0.41	2,936
	(0.50)	(0.49)	
Flooding[f]	0.11	0.11	2,936
	(0.32)	(0.31)	
Child Employment status (15-18)[g]		0.47	577
		(0.50)	

Source: Authors' estimations based on: [a] COVID-19 NLPS round 6; [b] GHS - Panel 2018/19; [c] COVID-19 NLPS round 1; [d] COVID-19 NLPS round 1-5; [e] SPEI; [f] IFRC; [g] COVID-19 NLPS round 5.

Notes: The proportion of respondents experiencing moderate food insecurity in 2020 comes from the COVID-19 NLPS round 4 conducted in August 2020. Given the attrition of some households in the COVID-19 NLPS round 4, the number of individuals for the variable *Moderate food insecurity* in 2020 is 2,881 compared to 2,936 in 2019. *AugmLockdown* takes value one if the person lives in states where additional lockdown measures were implemented, and zero otherwise (see section 2.2.3 for more details). The variables *Engaged in any learning activities* and *Contact with teacher* are generated from the first five rounds of the COVID-19 NLPS phone survey (see Section 2.2.3). The variable *Engaged in any learning activities* is not from the COVID-19 NLPS round 6 since this question is not submitted to respondents who returned to school in October 2020 and are not attending the 2020-2021 academic year's classes. Also, the question was not asked to respondents who did not attend school before COVID-19 (2019-2020 academic year). HH = household. Respondents whose schools were still closed at the time of the survey in October 2020, those who were still on leave or refuse to go to school because they were afraid of contracting the coronavirus, and those who were waiting for admission are excluded from the analysis. Standard deviations are reported in parenthesis.

Figure 2: *Non-parametric estimation of School Attendance pre-COVID-19 and COVID-19, by gender and area*



Source: *Authors' estimations based on COVID-19 NLPS round 6.*

Notes: *Respondents whose schools are still closed at the time of the survey in October* 2020, *those who are still on leave or refuse to go to school because they are afraid of contracting the coronavirus, and those that are waiting for admission are excluded from the analysis.*

Table 2: Impact of COVID-19's lockdown measures on school attendance

	(1)	(2)	(3)
Panel A: All respondents aged 5-18			
C19Shock	-0.0694***	-0.0804***	-0.0610***
	(0.00934)	(0.0166)	(0.0219)
C19Shock*AugmLockdown		0.0205	
		(0.0246)	
C19Shock*Rural			-0.0116
			(0.0261)
Pre COVID-19 mean	0.90	0.90	0.90
Number of individuals	2,936	2,936	2,936
Adjusted R-squared	0.645	0.645	0.645
Panel B: All respondents aged 5-11			
C19Shock	-0.0516***	-0.0675***	-0.0503**
	(0.0111)	(0.0219)	(0.0210)
C19Shock*AugmLockdown		0.0282	
		(0.0286)	
C19Shock*Rural			-0.00187
			(0.0271)
Pre COVID-19 mean	0.8943	0.8943	0.8943
Number of individuals	1,629	1,629	1,629
Adjusted R-squared	0.669	0.670	0.669
Panel C: All respondents aged 12-18			
C19Shock	-0.0864***	-0.0915***	-0.0704**
	(0.0121)	(0.0182)	(0.0278)
C19Shock*AugmLockdown		0.00996	
		(0.0291)	
C19Shock*Rural			-0.0227
			(0.0325)
Pre COVID-19 mean	0.9051	0.9051	0.9051
Number of individuals	1,307	1,307	1,307
Adjusted R-squared	0.613	0.612	0.613
Panel D: All respondents aged 15-18			
C19Shock	-0.116***	-0.103***	-0.0871***
	(0.0133)	(0.0210)	(0.0259)
C19Shock*AugmLockdown		-0.0138	
		(0.0325)	
C19Shock*Rural			-0.0330
			(0.0324)
Pre COVID-19 mean	0.8665	0.8665	0.8665
Number of individuals	681	681	681
Adjusted R-squared	0.657	0.656	0.656
Age fixed effects	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes
Control variables	Yes	Yes	Yes

Source: Authors' estimations based on COVID-19 NLPS round 6; *Notes*: Control variables are: household size and climatic shocks such as floods and drought. *AugmLockdown* takes value one if the person lives in states where additional lockdown measures were implemented (see section 2.2.3 for more details), and zero otherwise. Respondents whose schools are still closed at the time of the survey in October 2020, those who are still on leave or refuse to go to school because they are afraid of contracting the coronavirus, and those who are waiting for admission are excluded from the analysis. Standard errors are clustered at the LGAs level. *** p<0.01, ** p<0.05, * p<0.1

Table 3: Impact of schools' closure on school attendance by gender

	Boys			Girls		
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A: All respondents aged 5-18			
C19Shock	-0.0771***	-0.105***	-0.0749***	-0.0619***	-0.0561***	-0.0454**
	(0.0121)	(0.0223)	(0.0247)	(0.0116)	(0.0186)	(0.0204)
C19Shock*AugmLockdown		0.0508*			-0.0110	
		(0.0291)			(0.0290)	
C19Shock*Rural			-0.00315			-0.0223
			(0.0297)			(0.0269)
Pre COVID-19 mean	0.8944	0.8944	0.8944	0.9037	0.9037	0.9037
Number of individuals	1,535	1,535	1,535	1,401	1,401	1,401
Adjusted R-squared	0.635	0.637	0.635	0.665	0.665	0.665
			Panel B: All respondents aged 5-11			
C19Shock	-0.0457***	-0.0820***	-0.0385***	-0.0617***	-0.0559**	-0.0659**
	(0.0144)	(0.0306)	(0.0145)	(0.0143)	(0.0222)	(0.0314)
C19Shock*AugmLockdown		0.0662*			-0.0101	
		(0.0369)			(0.0355)	
C19Shock*Rural			-0.0101			0.00546
			(0.0256)			(0.0377)
Pre COVID-19 mean	0.8820	0.8820	0.8820	0.9072	0.9072	0.9072
Number of individuals	848	848	848	781	781	781
Adjusted R-squared	0.695	0.699	0.695	0.654	0.654	0.654
			Panel C: All respondents aged 12-18			
C19Shock	-0.104***	-0.120***	-0.109**	-0.0651***	-0.0587**	-0.0229
	(0.0188)	(0.0290)	(0.0426)	(0.0150)	(0.0247)	(0.0140)
C19Shock*AugmLockdown		0.0289			-0.0132	
		(0.0410)			(0.0344)	
C19Shock*Rural			0.00643			-0.0602**
			(0.0481)			(0.0251)
Pre COVID-19 mean	0.9109	0.9109	0.9109	0.8988	0.8988	0.8988
Number of individuals	687	687	687	620	620	620
Adjusted R-squared	0.558	0.558	0.558	0.683	0.682	0.685
			Panel D: All respondents aged 15-18			
C19Shock	-0.130***	-0.135***	-0.125***	-0.0772***	-0.0632*	-0.0378
	(0.0232)	(0.0305)	(0.0403)	(0.0215)	(0.0337)	(0.0235)
C19Shock*AugmLockdown		0.00870			-0.0291	
		(0.0431)			(0.0479)	
C19Shock*Rural			-0.00708			-0.0588
			(0.0491)			(0.0377)
Pre COVID-19 mean	0.8815	0.8815	0.8815	0.8416	0.8416	0.8416
Number of individuals	357	357	357	324	324	324
Adjusted R-squared	0.632	0.631	0.631	0.693	0.693	0.694
Age fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Individual fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors' estimations based on COVID-19 NLPS round 6; *Notes*: Control variables are: household size and climatic shocks such as floods and drought. *AugmLockdown* takes value one if the person lives in states where additional lockdown measures were implemented (see section 2.2.3 for more details), and zero otherwise. Respondents whose schools are still closed at the time of the survey in October 2020, those who are still on leave or refuse to go to school because they are afraid of contracting the coronavirus, and those who are waiting for admission are excluded from the analysis. Standard errors are clustered at the LGAs level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 4: Impact of COVID-19's lockdown measures on school attendance – heterogeneous effect

	Zone = North Central	Zone = North East	Zone = North West	Zone = South East	Zone = South South	Zone = South West
			Panel A: All respondents aged 5-18			
C19Shock	-0.0674***	-0.0691***	-0.0845***	-0.0604***	-0.0491***	-0.0644***
	(0.0146)	(0.0144)	(0.0162)	(0.0125)	(0.0108)	(0.0137)
C19Shock*Girl	-0.0129	-0.0174	0.0238	-0.0145	-0.0148	-0.0143
	(0.0203)	(0.0208)	(0.0170)	(0.0193)	(0.0177)	(0.0190)
C19Shock*Zone	0.0122	0.0218	0.0670***	-0.0396	-0.0995**	-0.0117
	(0.0237)	(0.0236)	(0.0248)	(0.0582)	(0.0494)	(0.0295)
C19Shock*Girl*Zone	0.0222	0.0412	-0.115***	0.0405	0.0358	0.0575*
	(0.0308)	(0.0314)	(0.0439)	(0.0498)	(0.0606)	(0.0294)
Pre COVID-19 mean	0.90	0.90	0.90	0.90	0.90	0.90
Number of individuals	2,936	2,936	2,936	2,936	2,936	2,936
Adjusted R-squared	0.645	0.646	0.647	0.645	0.648	0.645
			Panel B: All respondents aged 5-11			
C19Shock	-0.0463**	-0.0405**	-0.0501***	-0.0274	-0.0189	-0.0312*
	(0.0184)	(0.0189)	(0.0188)	(0.0170)	(0.0134)	(0.0175)
C19Shock*Girl	-0.0305	-0.0432	-0.0104	-0.0409	-0.0359	-0.0400
	(0.0276)	(0.0282)	(0.0224)	(0.0262)	(0.0245)	(0.0257)
C19Shock*Zone	0.0588**	0.0264	0.0503	-0.0611	-0.118*	-0.0430
	(0.0251)	(0.0260)	(0.0355)	(0.0571)	(0.0628)	(0.0854)
C19Shock*Girl*Zone	-0.0138	0.0485	-0.0777	0.0495	0.0177	0.0690**
	(0.0377)	(0.0400)	(0.0613)	(0.0695)	(0.0854)	(0.0350)
Pre COVID-19 mean	0.8943	0.8943	0.8943	0.8943	0.8943	0.8943
Number of individuals	1,629	1,629	1,629	1,629	1,629	1,629
Adjusted R-squared	0.672	0.672	0.672	0.671	0.676	0.670
			Panel C: All respondents aged 12-18			
C19Shock	-0.0895***	-0.0989***	-0.121***	-0.0966***	-0.0826***	-0.101***
	(0.0215)	(0.0210)	(0.0237)	(0.0192)	(0.0183)	(0.0206)
C19Shock*Girl	0.0108	0.0167	0.0647**	0.0207	0.0129	0.0191
	(0.0270)	(0.0268)	(0.0279)	(0.0248)	(0.0223)	(0.0258)
C19Shock*Zone	-0.0444	0.00886	0.0908***	-0.00794	-0.0801	0.0233
	(0.0435)	(0.0443)	(0.0327)	(0.0845)	(0.0694)	(0.0424)
C19Shock*Girl*Zone	0.0667	0.0331	-0.164***	0.0213	0.0568	0.0482
	(0.0529)	(0.0505)	(0.0460)	(0.0829)	0.0890	(0.0441)
Pre COVID-19 mean	0.9051	0.9051	0.9051	0.9051	0.9051	0.9051
Number of individuals	1,307	1,307	1,307	1,307	1,307	1,307
Adjusted R-squared	0.613	0.613	0.617	0.612	0.614	0.613
Age fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Individual fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors' estimations based on COVID-19 NLPS round 6; *Notes*: Control variables are: household size and climatic shocks such as floods and drought. The variable Zone is a dummy variable that takes the value one according to the respondent's zone. Respondents whose schools are still closed at the time of the survey in October 2020, those who are still on leave or refuse to go to school because they are afraid of contracting the coronavirus, and those who are waiting for admission are excluded from the analysis. Standard errors are clustered at the LGAs level. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Impact of COVID-19's lockdown measures on school attendance – Gender gap analysis based on Table 4

	Girl	Boy	Gender gap Girl - Boy
Panel A: All respondents aged 5-18			
Effect of C19Shock by gender in North Central	-0.0460**	-0.0552***	0.0092
	(0.01986)	(0.01884)	(0.0244)
Effect of C19Shock by gender in North East	-0.0234	-0.0473**	0.0238
	(0.0189)	(0.0184)	(0.0221)
Effect of C19Shock by gender in North West	-0.1089***	-0.0174	-0.0915**
	(0.0384)	(0.0157)	(0.0405)
Effect of C19Shock by gender in South East	-0.0739*	-0.0999*	0.0260
	(0.0407)	(0.0563)	(0.0452)
Effect of C19Shock by gender in South South	-0.1276**	-0.1486***	0.0210
	(0.0500)	(0.0478)	(0.0579)
Effect of C19Shock by gender in South West	-0.0328*	-0.0761***	0.0432*
	(0.0181)	(0.0251)	(0.0227)
Number of individuals	2,936	2,936	2,936
Panel B: All respondents aged 5-11			
Effect of C19Shock by gender in North Central	-0.0318	0.0124	-0.0443
	(0.0252)	(0.0182)	(0.0276)
Effect of C19Shock by gender in North East	-0.0089	-0.0141	0.0052
	(0.0268)	(0.0176)	(0.0272)
Effect of C19Shock by gender in North West	-0.0878**	0.00028	-0.0880
	(0.0412)	(0.0283)	(0.0564)
Effect of C19Shock by gender in South East	-0.0798	-0.0884	0.0085
	(0.0601)	(0.0537)	(0.0630)
Effect of C19Shock by gender in South South	-0.1551**	-0.1369**	-0.0182
	(0.0707)	(0.0615)	(0.0811)
Effet of C19Shock by gender in South West	-0.0452**	-0.0742**	0.0289
	(0.0209)	(0.0289)	(0.0236)
Number of individuals	1,629	1,629	1,629
Panel C: All respondents aged 12-18			
Effet of C19Shock by gender in North Central	-0.0564**	-0.1339***	0.0774
	(0.0249)	(0.0371)	(0.0454)
Effect of C19Shock by gender in North East	-0.0403*	-0.0900**	0.0497
	(0.0211)	(0.0388)	(0.0425)
Effect of C19Shock by gender in North West	-0.1295***	-0.0305	-0.0990**
	(0.0483)	(0.0209)	(0.0389)
Effect of C19Shock by gender in South East	-0.0624	-0.1045	0.0420
	(0.0382)	(0.0809)	(0.0782)
Effect of C19Shock by gender in South South	-0.0930*	-0.1627**	0.0696
	(0.0506)	(0.0657)	(0.0861)
Effect of C19Shock by gender in South West	-0.0107	-0.0780**	0.0673*
	(0.0215)	(0.0373)	(0.0356)
Number of individuals	1,307	1,307	1,307
Age fixed effects	Yes	Yes	Yes
Individual fixed effects	Yes	Yes	Yes
Control variables	Yes	Yes	Yes

Source: Authors' estimations based on COVID-19 NLPS round 6;
Notes: This table is estimated from Table 4. Columns (1) and (2) respectively, present the impact of COVID-19 on the school attendance of girls and boys in each geopolitical zone in Nigeria. Column (3) shows the gender gap of COVID-19 shock on school attendance in each zone. Control variables are: household size and climatic shocks such as floods and drought. The variable Zone is a dummy variable that takes the value one according to the respondent's zone. Respondents whose schools are still closed at the time of the survey in October 2020, those who are still on leave or refuse to go to school because they are afraid of contracting the coronavirus, and those who are waiting for admission are excluded from the analysis. Standard errors are clustered at the LGAs level. *** *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 6: Impact of COVID-19's lockdown measures on school attendance (using individuals who were at school before the schools closed only)

	(1)	(2)	(3)
C19Shock	-0.0874***	-0.139***	-0.108***
	(0.0107)	(0.0460)	(0.0191)
C19Shock*Learning activities		0.0610	
		(0.0500)	
C19Shock*Contact with teacher			0.0373
			(0.0253)
Number of individuals	2,688	2,688	2,688
Adjusted R-squared	0.076	0.081	0.080
Age fixed effects	Yes	Yes	Yes
Individual fixed effect	Yes	Yes	Yes
Control variables	Yes	Yes	Yes

Source: Authors' estimations based on COVID-19 NLPS round 6; *Notes*: Control variables are: household size and climatic shocks such as floods and drought. Respondents whose schools are still closed at the time of the survey in October 2020, those who are still on leave or refuse to go to school because they are afraid of contracting the coronavirus, and those who are waiting for admission are excluded from the analysis. The variable *Learning activities* takes value 1 when the child resides in a household where any child in the household has been engaged in any education or learning activity during the schools' closure period. Similarly, the variable *Contact with teacher* equals 1 when the respondent is in a household where any member of the household was in contact with his or her teacher during schools' closure. Standard errors are clustered at the LGAs level. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Impact of COVID-19's lockdown measures on school attendance by gender (using individuals who were at school before the schools closed)

	Boys			Girls		
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A: All respondents aged 5-11			
C19Shock	-0.0669***	-0.0600*	-0.0799***	-0.0735***	-0.193**	-0.0859***
	(0.0151)	(0.0327)	(0.0238)	(0.0152)	(0.0787)	(0.0275)
C19Shock*Learning activities		-0.00841			0.143*	
		(0.0379)			(0.0840)	
C19Shock*Contact with teacher			0.0251			0.0224
			(0.0298)			(0.0393)
Number of individuals	783	783	783	724	724	724
Adjusted R-squared	0.037	0.036	0.038	0.110	0.136	0.110
			Panel B: All respondents aged 12-18			
C19Shock	-0.127***	-0.178***	-0.175***	-0.0778***	-0.157**	-0.0880***
	(0.0201)	(0.0590)	(0.0308)	(0.0178)	(0.0654)	(0.0308)
C19Shock*Learning activities		0.0611			0.0905	
		(0.0630)			(0.0701)	
C19Shock*Contact with teacher			0.0878**			0.0187
			(0.0343)			(0.0374)
Number of individuals	631	631	631	550	550	550
Adjusted R-squared	0.108	0.111	0.122	0.086	0.093	0.085
			Panel C: All respondents aged 15-18			
C19Shock	-0.157***	-0.141**	-0.224***	-0.0992***	-0.273**	-0.147***
	(0.0280)	(0.0643)	(0.0402)	(0.0268)	(0.124)	(0.0455)
C19Shock*Learning activities		-0.0194			0.192	
		(0.0746)			(0.130)	
C19Shock*Contact with teacher			0.128***			0.0941
			(0.0489)			(0.0571)
Number of individuals	317	317	317	267	267	267
Adjusted R-squared	0.131	0.129	0.157	0.090	0.112	0.104
Age fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Individual fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes

Source: Authors' estimations based on COVID-19 NLPS round 6; *Notes*: Control variables are: household size and climatic shocks such as floods and drought. Respondents whose schools are still closed at the time of the survey in October 2020, those who are still on leave or refuse to go to school because they are afraid of contracting the coronavirus, and those who are waiting for admission are excluded from the analysis. The variable *Learning activities* takes value 1 when the child resides in a household where any child in the household has been engaged in any education or learning activity during the schools' closure period. Similarly, the variable *Contact with teacher* equals 1 when the respondent is in a household where any member of the household was in contact with his or her teacher during schools' closure. Standard errors are clustered at the LGAs level. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 8: Self-reported changes in household income since the beginning of the COVID-19 crisis in mid-March to August 2020, compared to August 2019

	(1) Decreased (in %)	(2) No change (in %)	(3) Increase (in %)	(4) No income from this source in 2019 (in %)
Household farming, livestock or fishing	55.5	11.14	31.30	2.02
Non-farm family business	61.82	11.74	24.85	1.59
Wage employment of household members	46.58	28.59	23.87	0.96
Total Household Income	66.44	14.29	19.27	0

Source: Authors' estimations based on COVID-19 NLPS round 4

Table 9: Percentage of children living in households whose members did not eat certain types of food

	Percentage
Imported rice	90.15
Chicken within the household	78.13
Beef within the household	51.59
Milk powder	65.52
Number of individuals	2,936

Source: Authors' estimations based on COVID-19 NLPS round 6.
Notes: This table presents the proportion of children living in households whose members did not eat the foods listed in the table on the 7 days preceding the COVID-19 NLPS round 6.

Table 10: Impact of COVID-19's lockdown measures on school attendance (excluding North-East region affected by Boko Haram)

	(1)	(2)	(3)
	Panel A: All respondents aged 5-18		
C19Shock	-0.0753***	-0.0884***	-0.0615***
	(0.0112)	(0.0213)	(0.0236)
C19Shock*AugmLockdown		0.0236	
		(0.0301)	
C19Shock*Rural			-0.0201
			(0.0303)
Pre COVID-19 mean	0.9017	0.9017	0.9017
Number of individuals	2,237	2,237	2,237
Adjusted R-squared	0.631	0.631	0.631
	Panel B: All respondents aged 5-11		
C19Shock	-0.0596***	-0.0757***	-0.0498**
	(0.0139)	(0.0291)	(0.0229)
C19Shock*AugmLockdown		0.0274	
		(0.0358)	
C19Shock*Rural			-0.0139
			(0.0331)
Pre COVID-19 mean	0.8977	0.8977	0.8977
Number of individuals	1,214	1,214	1,214
Adjusted R-squared	0.652	0.652	0.652
	Panel C: All respondents aged 12-18		
C19Shock	-0.0904***	-0.0998***	-0.0728**
	(0.0143)	(0.0222)	(0.0296)
C19Shock*AugmLockdown		0.0179	
		(0.0341)	
C19Shock*Rural			-0.0265
			(0.0363)
Pre COVID-19 mean	0.9071	0.9071	0.9071
Number of individuals	1,023	1,023	1,023
Adjusted R-squared	0.604	0.603	0.604
	Panel D: All respondents aged 15-18		
C19Shock	-0.112***	-0.101***	-0.0903***
	(0.0142)	(0.0240)	(0.0268)
C19Shock*AugmLockdown		-0.0121	
		(0.0362)	
C19Shock*Rural			-0.0262
			(0.0361)
Pre COVID-19 mean	0.827***	0.809***	0.803***
Number of individuals	550	550	550
Adjusted R-squared	0.678	0.669	0.669
Age fixed effects	Yes	Yes	Yes
Individual fixed effect	Yes	Yes	Yes
Control variable	Yes	Yes	Yes

Source: Authors' estimations based on COVID-19 NLPS round 6; *Notes*: Control variables are: household size and climatic shocks such as floods and drought. *AugmLockdown* takes value one if the person lives in states where additional lockdown measures were implemented (see section 2.2.3 for more details), and zero otherwise. Respondents whose schools are still closed at the time of the survey in October 2020, those who are still on leave or refuse to go to school because they are afraid of contracting the coronavirus, and those who are waiting for admission are excluded from the analysis. Standard errors are clustered at the LGAs level. *** p<0.01, ** p<0.05, * p<0.1.

Table 11: Pre-COVID-19 individual and household characteristics, respondents whose schools are re-open at the time of the survey vs. those whose schools are still closed or waiting for admission

	School reopened	Sch. still closed or waiting for admission	Diff in mean
School attendance	0.90	0.93	0.03**
	(0.01)	(0.01)	(0.014)
Age	9.92	9.99	0.07
	(0.10)	(0.17)	(0.200)
Child of the HH head	0.83	0.83	0
	(0.01)	(0.02)	(0.019)
Drought	0.56	0.50	-0.06**
	(0.01)	(0.02)	0.025
Flooding	0.11	0.11	0
	(0.01)	(0.02)	(0.018)
Household size	9.09	8.90	-0.19
	(0.15)	(0.16)	(0.220)
Gender (Girl)	0.48	0.47	-0.01
	(0.01)	(0.02)	(0.021)
Sector (Rural)	0.74	0.73	0.01
	(0.01)	(0.02)	(0.021)
AugmLockdown	0.56	0.58	0.02
	(0.01)	(0.02)	(0.025)
Engaged in any learning activities	0.85	0.84	-0.01
	(0.01)	(0.02)	(0.019)
Contact with teachers	0.52	0.46	-0.06**
	(0.01)	(0.02)	(0.025)
N	2,936	1,069	

Source: Authors' estimations based on the GHS - Panel 2018/19 and the COVID-19 NLPS round 1 to 6. *Notes*: The total number of children for whom schools are reopened is 2,937. However, for 1 child (out of the 2,937 children) school attendance before COVID-19 is not observed. Hence, the final number of individuals is 2,936. Standard errors are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 12: Impact of COVID-19's lockdown measures on children's school attendance (including also those not yet at school because their schools still closed, or still in holidays or afraid of the virus, and those who are waiting for admission)

	(1)	(2)	(3)
Panel A: All respondents aged 5-18			
C19Shock	-0.0469***	-0.0578***	-0.0351**
	(0.00767)	(0.0143)	(0.0175)
C19Shock*AugmLockdown		0.0201	
		(0.0194)	
C19Shock*Rural			-0.0164
			(0.0200)
Pre COVID-19 mean	0.9222	0.9222	0.9222
Number of individuals	3,946	3,946	3,946
Adjusted R-squared	0.636	0.637	0.636
Panel B: All respondents aged 5-11			
C19Shock	-0.0319***	-0.0444**	-0.0244
	(0.00943)	(0.0194)	(0.0191)
C19Shock*AugmLockdown		0.0224	
		(0.0234)	
C19Shock*Rural			-0.0101
			(0.0220)
Pre COVID-19 mean	0.9181	0.9181	0.9181
Number of individuals	2,182	2,182	2,182
Adjusted R-squared	0.658	0.658	0.658
Panel C: All respondents aged 12-18			
C19Shock	-0.0621***	-0.0711***	-0.0457**
	(0.00929)	(0.0148)	(0.0211)
C19Shock*AugmLockdown		0.0173	
		(0.0219)	
C19Shock*Rural			-0.0230
			(0.0242)
Pre COVID-19 mean	0.9280	0.9280	0.9280
Number of individuals	1,764	1,764	1,764
Adjusted R-squared	0.607	0.608	0.608
Panel D: All respondents aged 15-18			
C19Shock	-0.0792***	-0.0813***	-0.0560***
	(0.0116)	(0.0171)	(0.0196)
C19Shock*AugmLockdown		0.00396	
		(0.0246)	
C19Shock*Rural			-0.0331
			(0.0239)
Pre COVID-19 mean	0.9022	0.9022	0.9022
Number of individuals	946	946	946
Adjusted R-squared	0.654	0.654	0.655
Age fixed effects	Yes	Yes	Yes
Individual fixed effect	Yes	Yes	Yes
Control variables	Yes	Yes	Yes

Source: Authors' estimations based on COVID-19 NLPS round 6; *Notes*: Unlike in Table 2, where we restrict the sample to respondents whose schools reopened in October 2020, this table includes all respondents - whether or not their schools reopened in October 2020. Control variables are: household size and climatic shocks such as floods and drought. *AugmLockdown* takes value one if the person lives in states where additional lockdown measures were implemented (see section 2.2.3 for more details), and zero otherwise. We include respondents whose schools are still closed at the time of the survey in October 2020, those who are still on leave or refuse to go to school because they are afraid of contracting the coronavirus. These respondents are considered to be attending school if they plan to go to school after the schools reopen, after the holidays, or after the coronavirus situation gets better. We also include in this analysis respondents who attended school before COVID-19 and are waiting for admission in 2020. We assume that all of these respondents are attending school in 2020, i.e., during COVID-19. Standard errors are clustered at the LGAs level. *** p<0.01, ** p<0.05, * p<0.1.

Table 13: Reasons for not attending school in October 2020

	Reasons (in %)
Schools closed due to coronavirus	57.45
Schools closed for holidays	0.40
Had enough/completed schooling	2.36
Awaiting admission	11.38
No school nearby/lack of teachers	0.62
No time/no interest	1.26
Lack of money	12.04
Marital obligation	1.20
Death of parents	0.03
Too young to attend	5.46
Domestic obligation	0.78
Conflict (militancy/insurgency)	0.16
Worried about risk of contracting the virus	0.10
Others reasons	6.75

Source: Authors' estimations based on COVID-19 NLPS round 6.
Notes: This table presents the reasons given by children who do not attend school in October 2020, during COVID-19.

Table 14A: Sample of the main analysis

Age	Age: 5-18	Age: 5-11	Age: 12-18	Age: 15-18
	N = 2936	N = 1629	N = 1307	N = 681
Tables 1, 2, 3, 4, and 5	From the total sample of 4,006 individuals, we exclude individuals for whom schools are still closed in October 2020 because of the COVID-19's lockdown measures, individuals who are still on holidays, individuals who are worried about the risk of contracting the COVID-19, and individuals who are waiting for admission. Excluding these respondents, the number of individuals drops to 2,937. Before COVID-19, we do not observe the school attendance for one respondent in the sample. This respondent is excluded from the analysis, which brings the total sample size down to 2,936.	Among the 2,936 individuals aged 5-18, we restrict the sample to individuals aged 5-11.	Among the 2,936 individuals aged 5-18, we restrict the sample to individuals aged 12-18	Among the 2,936 individuals aged 5-18, we restrict the sample to individuals aged 15-18

Table 14B: Samples used in the robustness analyses

Age	Age: 5-18	Age: 5-11	Age: 12-18	Age: 15-18
Tables 6 and 7	N = 2,688	N = 1,507	N = 1,181	N = 584
	This analysis includes only individuals who were attending school just before schools closed in March 2020. Among the 2,936 individuals from the main specification, we exclude individuals who were not attending school before COVID-19 - which brings the sample down to 2,688 individuals.	Among the 2,688 individuals aged 5-18, we restrict the sample to individuals aged 5-11.	Among the 2,688 individuals aged 5-18, we restrict the sample to individuals aged 12-18.	Among the 2,688 individuals aged 5-18, we restrict the sample to individuals aged 15-18.
Table 10	N = 2,237	N = 1,214	N = 1,023	N = 550
	This analysis excludes individuals from the North-East - an area affected by Boko Haram. Among the 2,936 individuals from the main specification, we exclude individuals from the North-East region - which brings the sample down to 2,237 individuals.	Among the 2,237 individuals aged 5-18, we restrict the sample to individuals aged 5-11.	Among the 2,237 individuals aged 5-18, we restrict the sample to individuals aged 12 -18.	Among the 2,237 individuals aged 5-18, we restrict the sample to individuals aged 15 -18.
Table 12	N = 3,946	N = 2,182	N = 1,764	N = 946
	This analysis includes all respondents - whether or not their schools reopened in October 2020. However, we exclude from the sample, the respondent for whom we do not observe school attendance before COVID-19. In this analysis, instead of excluding respondents who were awaiting admission in 2020 or treating them as if they did not attend school in 2020, we assume that these respondents are all attending school in 2020. However, for those respondents who did not attend school during the 2019 - 2020 academic year (Before COVID-19) and who state in October 2020 that they are waiting for admission, we assume that they are unlikely to attend school. As a result, we exclude them from the analyses, bringing the sample size to 3,946.	Among the 3,946 individuals aged 5-18, we restrict the sample to individuals aged 5 - 11.	Among the 3,946 individuals aged 5-18, we restrict the sample to individuals aged 12 - 18.	Among the 3,946 individuals aged 5 - 18, we restrict the sample to individuals aged 15 - 18.