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Can international remittances mitigate negative effects of economic shocks on education? – The case of Nigeria

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Abstract

This study examines whether international remittances can help households mitigate the negative effects of economic shocks on schooling. To test if remittance-receiving households are less likely to withdraw their children from school in response to a shock, this dissertation runs a difference-in-differences analysis with household fixed effects. School attendance of children from remittance and non-remittance households in Nigeria is contrasted, before and after the economic downturn leading up to the 2016 recession. The results show that in rural Nigeria, where poverty is more prevalent, the negative effect of the economic decline on schooling is 21% smaller for remittance-receiving households compared to households that do not receive remittances. This supports the claim that international remittances can help households insure against domestic shocks, making it easier for them to invest in their children's education during economically volatile times.

Abbreviations

- BMGF: Bill and Melinda Gates Foundation

- CPI: Consumer Price Index

- FDI: Foreign Direct Investment

- FGN: Federal Government of Nigeria

- FPI: Foreign Portfolio Investment

- GHS-Panel: Nigeria General Household Survey, panel component

- hhid: Unique household ID

- indiv: Individual ID

- NBS: National Bureau of Statistics (Nigeria)

- SDG: Sustainable Development Goal

- UNESCO: United Nations Educational, Scientific and Cultural Organization

- WB: The World Bank

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1. Introduction

As of 2019, international remittance flows are over three times greater than official development assistance. With the exception of China, they have even surpassed foreign direct investment as the largest source of external financing for developing countries (Barne and Pirlea, 2019). It is, therefore, no surprise that remittances, which are money transfers sent by migrants back to their home countries, have become a lifeline for many families in developing countries. In the past, some scholars have criticised remittances for discouraging recipient households from working (Rodriguez and Tiongson, 2001; Funkhouser, 1992) and creating a dependency on foreign countries (Taylor et al., 1996a, 1996b). More recent literature, however, increasingly stresses the positive development impact of remittances in relieving credit and insurance constraints, thereby allowing households to invest in human capital and micro-entrepreneurship (Finkelstein Shapiro and Mandelman, 2016; Mansuri, 2006; Cox and Ureta, 2003).

Numerous scholars highlight that remittances have a positive effect on education and decrease the necessity for children to work by raising household income (Cox and Ureta, 2003; Mansuri, 2006; Hanson and Woodruff; 2002). Other studies focus on the insurance function of remittances, explaining that international remittances help households to cope with unexpected shocks as they are usually unaffected by domestic conditions (Gubert, 2002; Lucas and Stark, 1985). To the best of my knowledge, only Calero et al. (2009) combine these research fields by looking at the impact of remittances on education outcomes in Ecuador during individual shocks, natural catastrophes and aggregate agricultural shocks. Since shocks often decrease schooling when households have no access to a well-functioning credit market (Ferreira and Schady, 2008), as is the case in most developing countries, it is an extremely prominent issue that requires greater investigation. To address this research gap, this dissertation examines whether international remittances can help recipient households to insure against shocks, allowing them to maintain investments into education, by looking at a different geographic region than Calero et al. (2009) did, namely Nigeria instead of Ecuador, and by analysing a different type of shock.

Focusing on Nigeria is particularly interesting because Nigeria has the highest absolute number of children out of school worldwide (UNICEF Nigeria., n.d) and most households in Nigeria are heavily credit constrained (Carlson et al., 2015). Furthermore, Nigeria experienced a drop in GDP growth following the fall of the oil price in 2014, resulting in a recession in 2016. This provides an opportunity to test whether international remittances help mitigate negative effects on education caused by an aggregate economic shock, which is very different from the shocks analysed by Calero et al. (2009). Linking predictions from the literature on the effect of economic shocks on schooling, on the impact of remittances on education and on the insurance role of remittances, I hypothesise that international remittances helped recipient households in Nigeria to cope with the economic decline, thereby allowing them to send their children to school.

To test this hypothesis, publicly available panel data from 2012/13 and 2015/16, before and after Nigeria experienced a strong decline in GDP growth is extracted from the World Bank Microdata Library (The World Bank Microdata Library, 2020b and 2020c). Whether remittances helped households to send their children to school during the economic decline is estimated by using a difference-in-differences design with household fixed effects. After an initial analysis, the sample is restricted to exclude households that only reported remittances in either 2012/13 or 2015/16 to evaluate how much of the observed effect is driven by households that received remittances across both periods compared to households that never received remittances. Considering that the economic decline seems to have primarily increased liquidity constraints in rural Nigeria, a further analysis is conducted by splitting the restricted sample into rural and urban households (The World Bank, 2017).

In line with my hypothesis, my results show that the negative effect of the economic crisis on schooling is 21% less severe for rural households that receive remittances across both periods compared to households that did not receive money transfers from abroad. This indicates that international remittances can moderate the negative impact of economic downturns on schooling by reducing liquidity constraints, at least in rural areas where poverty is more prevalent. This result is in line with evidence from Calero et al. (2009), who also find that remittances play a particularly important role in mitigating the negative effects of shocks on schooling in rural areas. While data

constraints do not allow to formally test the mechanism behind this effect, some evidence is provided in favour of remittances being sent for insurance purposes because the mean remittance value received by households increased during the economic decline.

The remaining paper is structured as follows. Section two presents a critical review of the current literature, discussing the impact of economic shocks on schooling, the effect of remittances on education and their insurance function. Section three explains the focus on Nigeria. Section four provides an overview of the data and methodology, whilst section five presents and analyses the findings including a discussion of the potential mechanism underlying the treatment effect. Section six highlights limitations associated with the research design and areas for future research. Section seven concludes.

2. Literature Review

This research lies at the intersection of three topics; (i) the effect of aggregate shocks on schooling, (ii) the impact of international remittances on education and (iii) the role that remittances play as a coping mechanism during shocks. Theoretical and empirical works from all three strands of literature inform the research focus and the analysis of this study.

How economic shocks affect schooling

Ferreira and Schady (2008) developed a model of educational choice that helps to predict how aggregate economic shocks influence the demand for education. Their model assumes that households derive utility from consumption and that education is only important insofar it raises future incomes. Each household faces a trade-off between two options: (i) increasing disposable income available for immediate consumption by sending children to work, or (ii) allowing them to attend school, thus improving their earnings prospects and household's future consumption. This view is common in human capital theory and conceptual frameworks that draw on it to explain parents' demand for their children's education (Blaug, 1987; Acharya and Leon-Gonzalez, 2014). Ferreira and Schady's (2008) model is unique because it links demand for education with economic shocks. They predict that if economic growth

declines, parents' decision whether to send their children to work or school is affected by a decrease in household income and worsening job prospects for children.

Most importantly, the impact of an economic shock on the demand for education depends on the presence of a developed credit market. When households have access

Figure 1 - Ferreira and Schady Model
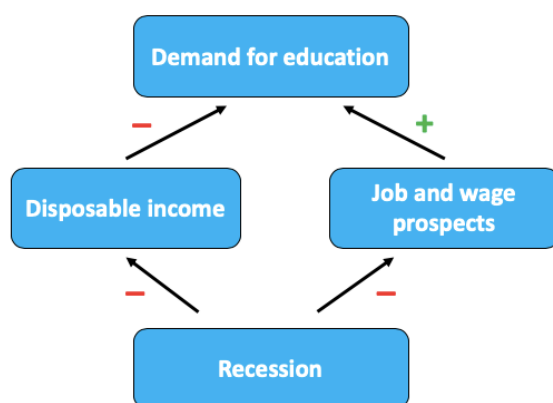
Source: Author's depiction of the model

to a good credit market, they can borrow money to mitigate drastic changes in consumption. A temporary fall in income, therefore, does not usually affect schooling, while lower wage prospects for children reduce the opportunity costs of education, making it more likely that children attend school. However, if households cannot access a well-functioning credit market, as in most developing countries, then the relative strength of a negative income effect and a positive substitution effect determines the net impact on schooling. On the one hand, economic downturns negatively affect wage and job prospects for children, decreasing the opportunity costs of spending time in school instead of working. On the other hand, economic shocks tend to reduce disposable income, increasing the need for children to contribute financially (Ferreira and Schady, 2008).

A range of empirical evidence supports these predictions. Goldin (1999) shows that the United States has experienced the largest increase in demand for education during the Great Depression, Schady (2004) finds that in Peru economic crises improve education outcomes for children who both work and attend school and McKenzie (2003) demonstrates that the Mexican Peso Crisis increased schooling for children across both urban and rural regions. However, in the presence of large credit constraints, an economic crisis can also reduce a household's ability to pay for education, negatively impacting school enrolment rates (López Bóo, 2008). The "drop out story" is supported by evidence from Malawi (Hyder et al., 2015); Cote d'Ivoire (Jensen, 2000), Tanzania (Beegle et al., 2006) and Indonesia (Thomas et al., 2004).

The impact of remittances on education

It is highly debated whether remittances only increase consumption or if a meaningful share is spent on productive investments, thereby contributing to long-run development. Consumption refers to everyday expenses, while productive expenditures are schooling payments and investments (Nurwati et al., 2018). Many studies report that remittances are primarily spent on consumption (Sukamdi et al., 2004; Durand et al., 1996; Gilani, 1981; Glytsos, 1993 and 2002; Oberai and Singh, 1980), and in most contexts, just 10-15% of remittances are invested into education (Nurwati et al., 2018; Fonta et al., 2015). Nevertheless, many scholars confirm that international remittances are linked to increased schooling and a decline in child labour (Mansuri, 2006; Cox and Ureta, 2003; Hanson and Woodruff; 2003).

A few studies find more mixed results. For example, Acosta et al. (2007) found that across eleven Latin American countries, remittances increase schooling in only six of them. Studies by McKenzie and Rapoport (2006) as well as López-Córdova (2005) find that in Mexico remittances only increase schooling among younger children, particularly girls, but negatively affect secondary schooling. Salas' (2014) and Koska et al. (2013) explain that the influence of remittances on schooling depends on two opposing effects; a positive effect as remittances increase disposable income and a negative effect because children often grow up without one or both of their parents present. Both studies find that the positive remittance effect outweighs the negative impact of parents' absenteeism and education outcomes improve as a result of remittances, but in other settings, the net effect might be negative.

The insurance function of remittances

Remittances do not only affect a child's schooling, but they are also used to cope with a diverse range of shocks including rainfall shocks, droughts, health shocks or drops in GDP growth (see Beuermann et al., 2016; Halliday, 2006; Miller and Paulson, 2007; Yang and Choi, 2007; Stark and Rosenzweig, 1989). In the presence of poorly functioning credit markets, remittances can represent an informal insurance agreement between the family member who migrates and the household they are part of. Households with poor access to credit and insurance might send a family member to work overseas as employment in another country is usually unaffected by shocks or

risks that constrain economic activity in the home country. The same logic can also explain rural to urban migration when risks across rural and urban areas are not strongly linked. Sending someone from the household to work abroad or to a different region of the country can help households to diversify their income portfolio, making it easier to cope with unexpected shocks (Rapoport and Docquier, 2006; Gubert, 2002; Taylor, 1999; Lucas and Stark, 1985).

However, informal familial insurance arrangements can be subject to moral hazard due to information asymmetries between the household and the migrating family member. For example, families may be inclined to decrease the time they spend working because migrants agree to provide insurance for a certain consumption level (Rapoport and Docquier, 2006; Gubert, 2002; Lucas and Stark, 1985). Therefore, an insurance agreement is usually linked with some degree of altruism because mutual altruism can reduce moral hazard problems and help enforce voluntary agreements (Lucas and Stark, 1985). In general, remittances should allow households to smooth consumption when facing unexpected shocks, decreasing the necessity for children to work instead of going to school. Without access to remittances, shocks can cause transient poverty, which can be a severe barrier for access to education with negative consequences for long-run human capital development (Beegle et al. 2006; Dehejia and Gatti, 2005; Jacoby and Skoufias, 1997). Income volatility can be particularly harmful to girls because in the presence of limited resources boys' education tends to be prioritised (Sawada, 2003).

In summary, remittance-receiving households are more likely to have their children in school and less impacted by domestic conditions than households that solely rely on domestic income sources. This creates an interesting link between studying remittances and exploring the negative impact that aggregate shocks can have on education in credit-constrained countries. This dissertation explores this link by looking at the economic decline leading up to the 2016 recession in Nigeria.

3. Case Study Selection: Nigeria

Nigeria is particularly interesting as a case study to evaluate whether or not remittances help households to cope with domestic shocks, thereby increasing the probability that children stay in school, for three key reasons:

Firstly, Nigeria experienced a sharp decline in economic growth at the end of 2014 when the oil price plummeted, following fifteen years of relatively high GDP growth. The low oil price heavily impacted the government budget and export earnings, which are to 70% and 90% respectively financed by oil revenues. Nigeria's high dependence on oil exports also created a foreign exchange shortage, making it extremely difficult for producers to import goods (Fick, 2017). Overall, this resulted in the GDP growth falling from an average of 7% per annum between 2000 and 2014 to 2.7% per year in 2015. In 2016, the economic decline was officially categorised as a recession with GDP growth being -1.6% (BBC News, 2016; The World Bank, 2020a). The timing of the economic shock creates the opportunity to study a causal effect because data is available for 2012/13 (pre-decline) and 2015/16 (post-decline) (The World Bank Microdata Library, 2020b and 2020c). Comparing households that receive remittances and households who do not before and after the economic decline helps overcome endogeneity problems, such as selection bias, that are common when estimating the effect of remittances on school enrolment. Figure 2 illustrates that GDP and oil rents follow similar trends. At the end of 2014, when oil prices plummeted both oil rents and GDP decreased significantly. Oil rents are defined as the world price of crude oil minus the total production expenses (The World Bank, 2020c).

Figure 2 - Nigeria: Macroeconomic Trends
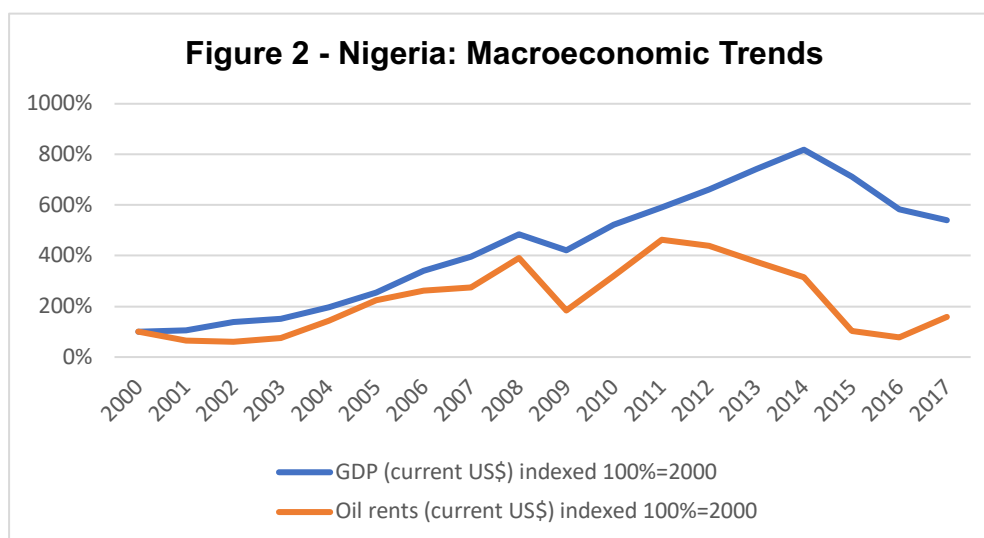
Source: The World Bank, 2020c. Both oil rents and GDP were indexed with 100% being equal to the year 2000.

Secondly, Nigeria is interesting to study because a large share of Nigerian households has no access to formal credit (Saifullahi and Haruna, 2012, Carlson et al., 2015), therefore a fall in GDP growth is expected to negatively impact schooling. The Central

Bank of Nigeria reported that in 2012, only 36% of the adult population used formal financial services, compared to 41% in Kenya and 68% in South Africa (Central Bank of Nigeria, 2012). In line with the prediction that the economic decline has a negative effect on schooling, macroeconomic data shows a decrease in both primary and secondary school enrolment between 2013/14 and 2015/16, as illustrated in Table 1. However, the exact numbers need to be interpreted with caution because gross enrolment is the ratio of all children enrolled at a certain school level, irrespective of their age, to all children of official primary/secondary school age. Therefore, a high enrolment rate can simply imply that many children who are older than the official school age are attending school because they repeated a class or enrolled late. Net enrolment rates are better measures as they only count children enrolled at a certain school level if they are of the official corresponding school age. However, for Nigeria the net ratio is only available until 2010 for primary school enrolment and unavailable for secondary school enrolment. For the purpose of comparison, in 2010, primary school enrolment (% net) was 64% compared to 85% (% gross). Net enrolment rates are probably considerably lower than gross enrolment rates, but they are likely to follow similar trends (UNESCO Institute for Statistics, 2020).

Table 1:
Primary and secondary school enrolment rates in Nigeria

	2013	2014	2015	2016
Primary school enrolment (% gross)	94.1%	90.1%	Missing value	84.7%
Secondary school enrolment (% gross)	56.2%	45.6%	46.8%	42%

Source: UNESCO Institute for Statistics, 2020.

Thirdly, Nigeria is Africa's largest remittance receiver in absolute terms and Fonta et al. (2015) find that education expenditure accounts for more than 15% of total remittance expenditure. Primary and secondary education is technically free of charge in Nigeria, but parents are expected to pay for uniforms, levies and sometimes school meals, so education is associated with costs in addition to the opportunity costs of going to school instead of working (Lincove, 2009; Francis, 1998). Remittances may reduce liquidity constraints for households during economic shocks, making it easier for families to send their children to school.

A concern when analysing the remittance effect on schooling during economic shocks is that public education expenditure may be procyclical, magnifying the adverse effect caused by a reduction in household income (Ferreira and Schady, 2009). Nigeria's education system is known to be severely underfunded, which at least partially explains low enrolments rates (Ebi and Ubi, 2017; Obi et al., 2013; Anyanwu and Erhijakpor, 2007), and data from the Nigeria Central Bank shows that government education expenditure has declined after 2013. Recurrent public expenditure into education was 390 billion Naira in 2013, 344 billion Naira in 2014, 325 billion Naira in 2015 and 339 billion Naira in 2016 (Central Bank of Nigeria, 2018). If the government plays an important role in providing education, a decrease in public expenditure can reduce access to education, thus strengthening the negative income effect (Ferreira and Schady, 2009). If children of remittance-receiving households are more likely to attend private schools, they may be less affected by supply-side issues such as lack of teachers, so it is important to control for educational supply-side issues.

Based on the literature described in section two and the background information on Nigeria, this dissertation tries to fill the research gap outlined in the introduction by addressing the following question: *Can international remittances help recipient households in Nigeria insure against the negative effect of an economic shock on schooling?* Given the context of Nigeria as well as the theory and the predictions by the literature, I hypothesise the following: *Remittances helped recipient households in Nigeria to invest in their children's education during 2014-2016, when economic growth plummeted.* Since Riley (2018) found that remittances in Nigeria only reduce the negative effect of income shocks for remittance-receiving households and are not used for risk-sharing among villagers, remittances can only affect the income of non-remittance households through the consumption multiplier effect, which is estimated to be very small and should thus have a negligible effect, if any consequence at all (Etowa, 2016). Consequently, I expect that the difference in the share of school-aged children attending school, between households that receive remittances and households that do not, increased between 2014-2016.

4. Data and Methodology

Data Source

To undertake a difference-in-differences analysis this study uses publicly available household data published by the World Bank. The two main data sets that are used are called General Household Survey, Panel 2012-2013, Wave 2 and General Household Survey, Panel 2015-2016, Wave 3 (The World Bank Microdata Library, 2020b and 2020c). To map the parallel trend assumption and to conduct a placebo test, data from wave 1 and wave 4 are also used (The World Bank Microdata Library, 2020a and 2020d). The GHS-panel was produced by the NBS with technical assistance from the Federal Ministry of Agriculture and Rural Development and the National Food Reserve Agency. The funding for the GHS-panel came from the FGN, the WB and BMGF. 5000 households that reflect Nigeria's six geopolitical zones were selected. Each household was visited twice, once during August-October, in the post-planting period and once during February-April, in the post-harvest period, irrespective of whether they work in agriculture or not. Some questions were asked post-planting, others post-harvest and some during both visits. Since households were selected in 2010/11 during wave 1 and were not replaced if they could not be located during the second visit or subsequent waves, the actual sample of interviewed households during each wave was marginally below the 5000 households that were initially selected. In wave 2, 4851 households could be located and interviewed during both visits, while in wave 3 it was 4581 households (Nigeria – GHS, Panel 2012-2013, Wave 2 - Study Description, 2020/ Nigeria – GHS, Panel 2015-2016, Wave 3 – Study Description, 2020).

A limitation with using this data is that only 91 households report receiving remittances in 2012/13, 160 in 2015/16 and just 30 households reported remittances across both periods. The small sample size of the treatment group, especially after restricting the sample to households that receive remittances across both periods, reduces the validity of the results because the treatment group may not be representative of Nigeria's remittance-receiving households. Given the lack of alternative microdata that captures both education and remittance values in Nigeria and the relevance of this research in this context, I proceed with my analyses by relying on the GHS-panel despite this limitation.

Variables

To run the difference-in-differences regressions, it is necessary to construct several new variables. The chosen unit of analysis is the household because migration and schooling decisions are usually made at the household level (Stark and Bloom, 1985; Gubert, 2002) and household characteristics strongly influence whether children can attend school or not. Including household fixed effects holds time-invariant household characteristics constant.

Outcome Variable

The dependent variable is the share of school-aged children in school. To estimate this variable, it is necessary to merge personal and educational data for each individual in the household. Since no individual unique identifiers are available, I created them by adding the individual ID within the household (indiv) at the end of each unique household ID (hhid), as suggested in an information document on the Nigerian GHS-Panel (Basic Information Document Nigeria General Household Survey–Panel, 2013). Using the individual unique identifier, it is possible to create a dummy that equals one if the individual is of school age (6-17) to account for primary and secondary education. In Nigeria, compulsory basic education, includes primary school (age 6-12) and junior secondary school (age 12-14). Senior secondary education is a three-year course from age 14-17 (ILO, 2004-2005). Another variable is created that shows if the individual of school age is in school in 2012/13 or 2015/16. The two new variables are then collapsed at the household level to estimate the share of school-aged children attending school in the respective year, a continuous variable ranging from 0-1. Approximately one third of households do not have any children of school age, so they are assigned a missing value.

Treatment Variable

The treatment variable is a dummy that is set equal to 1 if at least one household member received remittances within the past 12 months. The dummy reflects the answer to "Did (name) receive a monetary gift from abroad in the past 12 months? (s62q)" *(*The World Bank Microdata Library, 2020b and 2020c). It is important to choose a question, which defines the time frame as one year prior to data collection to be able to exploit the variation induced by the economic decline.

Control Variable

Supply-side issues are widespread in Nigeria because in recent years, the Nigerian government only allocates around 3% of its budget to education, which is astonishingly low compared to other developing countries. In Botswana, Kenya or Ghana, for example, around 20% of the budget is spent on education. This is particularly alarming in the context of Nigeria's strong population growth of 2.6% and with 45% of the population being children below the age of fifteen, which increases the need for investments in education (UNICEF, 2015; The World Bank, 2020c). Therefore, I control for the share of school-aged children per household that is not in school due to supply-side issues, which includes "no teacher, no schools" and "awaiting admission". Remittances can only influence the demand of education, not the supply, and controlling for supply-side issues can help isolate the treatment effect from potential changes in supply-side factors that can occur simultaneously. This can help to estimate the treatment effect with greater precision and to make sure that the parallel trend assumption holds. For a more detailed description of all variables see Appendix 2.

Empirical Strategy

Estimating the effect of remittances on schooling during economic shocks is difficult because the analysis may suffer from endogeneity bias (Calero et al., 2009). Omitted variables, such as parents' education, may simultaneously affect human capital decisions and remittance supply. For example, a better educational background increases the chance for migrants to receive working permits for abroad and send remittances, whilst parents' education can also directly impact children's education. More generally, selection bias is concerning as well because there are likely to be systematic differences between remittance-receiving families and families that do not get remittances. Many papers address the concern that remittances could be endogenous to schooling decision and child work by instrumenting for remittances using the existence of migration networks or historic migration rates (e.g., Acosta et al., 2007; Hanson and Woodruff, 2003; Mansuri, 2006; McKenzie and Rapoport, 2006). This paper addresses endogeneity problems by employing a difference-in-differences analysis with household fixed effects that allows for a comparison in changes as opposed to levels, which removes time-invariant disparities between remittance-receiving households and households that do not receive remittances (Angrist and

Pischke, 2009). By comparing changes in schooling across remittance and non-remittance households before and after Nigeria's economic decline, this paper explores the role remittances play as a coping mechanism during economic shocks and their effect on schooling, instead of just looking at the effect of remittances on education, which adds another dimension to the analysis that remains widely unexplored in the literature.

Parallel Trend Assumption

The key identifying assumption of a difference-in-differences analysis is the parallel trend assumption, which assumes that without the differential effect of the economic decline on remittance- and non-remittance-receiving households, both groups would

Figure 3 – Share of school-aged children in school
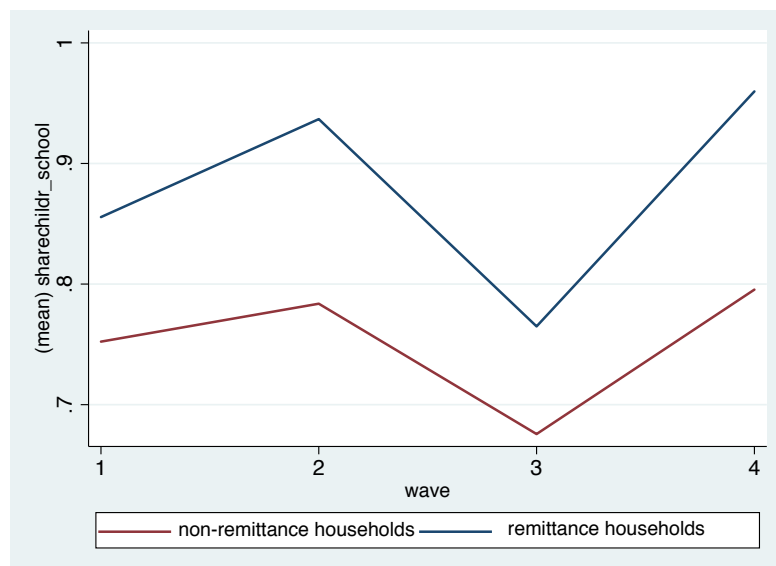
Source: World Bank Microdata Library, 2020a/b/c/d

have experienced roughly the same changes in schooling, albeit at different levels. Hence, the change from a parallel trend is only caused by the economic decline (=the treatment) (Angrist and Pischke, 2009; Lechner, 2011). The claim of causality relies on the parallel trend assumption, therefore it is crucial to assess its credibility. It is

impossible to test parallel trends during the actual treatment period because it involves counterfactuals. Thus, it is common to look at trends for remittance- and non-remittance-receiving households before the treatment took place (wave 1 and 2) (Angrist and Pischke, 2008). Figure 3 depicts the mean share of school-aged children in school for households that received remittances and households that did not for wave 1 (2010/11), wave 2 (2012/13), wave 3 (2015/16) and wave 4 (2018/19). The graph needs to be interpreted with caution because there are large time lags between data points. Figure 3 illustrates that remittance and non-remittance households follow roughly parallel trends between wave 1 and 2, although at different levels, with remittance-receiving households being more likely to have their children in school. This

shows that in the context of Nigeria the positive income effect of remittances outweighs the negative impact of parents' absenteeism, resulting in higher education among children of remittance households. However, the graph does not clearly show a treatment effect at wave 3, indicating that there might be a confounding trend. If my hypothesis holds, the decline in the share of school-aged children in school between wave 2 and 3 should be shallower for recipient households (blue line) than for non-recipient households (red line). Section five elaborates on the potential of supply-side issues confounding the treatment effect and the importance of controlling for the share of children who are not in school due to supply-side issues. To test the parallel assumption more formally a placebo test is conducted, represented in section five under robustness checks.

Estimation technique

To address the research question outlined in section three and to estimate whether remittances can help households cope with economic shocks and send their children to school, a difference-in-differences analysis is conducted. The main specification is expressed as follows:

$$\textit{share of school-aged children in school}_{ht} = \alpha_h + \text{\ss}_1\ \textit{remittance}_h + \text{\ss}_2\ \textit{post}_t + \text{\ss}_3$$
$$(\textit{remittance}_h \times \textit{post}_t) + E_{ht}$$

The outcome variable *share of school-aged children in school*$_{ht}$ is a measure of the share of school-aged children attending school for household h in period t and is a continuous variable ranging from 0-1. The variable α_h represents household fixed effects, which controls for time-invariant differences between households. The variable *remittance*$_h$ divides households into treatment and control group according to whether at least one person in the household receives remittances. In the initial analysis, *remittance*$_h$ is equal to 1 for households who receive remittances across both periods and households who only receive remittances in either the pre- or post-period. Since it is ambiguous how to interpret the results if the sample includes all these different types of remittance households, the sample is later restricted to exclude households that only receive remittances in one period. Therefore, *remittance*$_h$ in the restricted sample is only equal to 1 if a household received remittances across both waves. *Post*$_t$ is a dummy equal to 1 for 2015/16 (=wave 3), after Nigeria economic growth

plummeted in 2014, leading up to the 2016 recession. The interaction term interacts *remittance$_h$ and post$_t$* and is a binary variable equal to 1 if a household receives remittances in 2015/16. The coefficient of interest is ß$_3$, which in the restricted sample captures the difference between the effect of the economic decline on remittance-receiving households versus households that do not receive remittances from abroad. To address heteroskedasticity all specifications use robust standard errors. Standard errors are also clustered at the household level to deal with serial correlation given the use of panel data (Angrist and Pischke, 2009). All regression tables report t-statistics in parentheses.

5. Findings and Discussion

Difference-in-Differences Results: Unrestricted Sample

Table 2 reports the regression results for the unrestricted sample with the main explanatory variable being the interaction term (remittance x post) and the outcome variable being share of school-aged children in school. Household fixed effects are included in both column 1 and 2.

Table 2:
Regression Results Unrestricted Sample

Dependent variable:	Share of school-aged children in school	
	(1)	(2)
Remittance	-0.074	-0.098
	(1.29)	(2.27)**
Post	-0.087	-0.148
	(10.54)***	(20.40)***
Remittance x Post	0.073	0.115
	(1.10)	(2.18)**
Share of school-aged children		-0.512
affected by supply-side issues		(25.44)***
Constant	0.765	0.856
	(189.67)***	(187.02)***
R^2	0.04	0.26
Observations	6196	6196
Household fixed effects	Yes	Yes

t-statistics in parentheses
Significant at * 10%, ** 5%, *** 1% levels.

Source: The World Bank Microdata Library, 2020b and 2020c

In column 1, which reports the baseline regression, the coefficient of the interaction term is statistically insignificant. Column 2 controls for a potential confounding trend, namely the share of children not in school due to supply-side issues. Educational supply-side issues, such as a lack of teachers or schools, may confound the treatment effect if children of recipient households and non-recipient households are impacted differently and if the way each group is affected by supply-side issues changes over time. The reason why treatment and control group children might be affected differently could be that children of remittance households are more likely to attend private schools and could, thus, subject to less supply-side issues. For example, Salas (2014) finds that households who receive international remittances in Peru are more likely to send their children to private schools and Valatheeswaran and Khan (2018) find the same to be true in Kerala, India.

Figure 4[1] maps the mean share of children of school age who did not attend school due to educational supply-side issues across waves. The graph shows that in wave 2 (2012/13) children of non-recipient households were disproportionally negatively affected by supply-side issues (12%), such as awaiting admission, or no availability of schools and/or teachers compared to children of recipient households (4%). This stark

Figure 4 – Share of school-aged children affected by supply-side issues
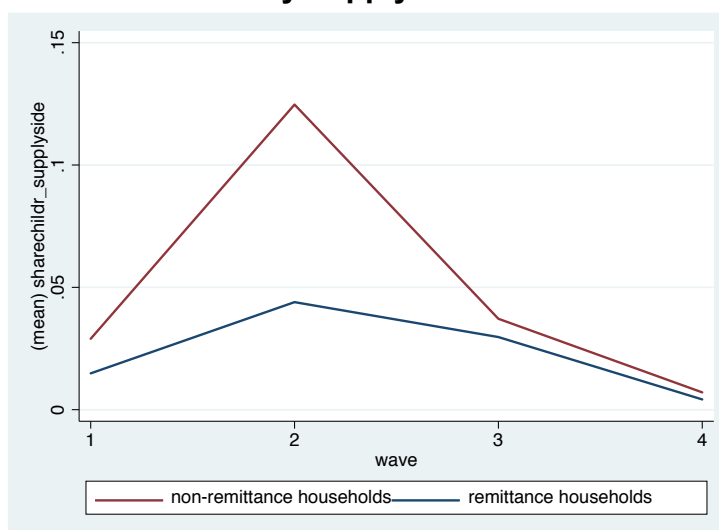
Source: World Bank Microdata Library, 2020a/b/c/d

difference between children of remittance and non-remittance households decreased significantly between wave 2 and 3, when only 3.7% of children of non-remittance households were affected by supply-side issues compared to 3% of children of

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[1] The wave 4 the variable *share of school-aged children affected by supply-side issues* is using education data from 2017/18 because the question "Why is (name) not currently in school?" was only asked in wave 1-3 and in wave 4, the only question referring to supply-side issues was "Why did (name) not attend school during the 2017/2018 school year?". The age variable, which was collected in 2018/19, was adjusted by one year to reflect whether children were of school age in 2017/18. The remittance variable is only available for 2018/19, so the divide in remittance and non-remittance households is using 2018/19 data, proxying remittances a year earlier.

remittance households. It is surprising that less children were affected by supply-side issues in wave 3 compared to wave 2 because given the decrease in government expenditure between 2013-2016 described in section three, the opposite would be expected. The fact that children of non-remittance households were less affected by supply-side issues in 2015/16 compared to 2012/13, implies that in absence of the economic decline, they would have been more likely to have attended school. This confounds the treatment effect, which supposes that the difference in schooling between remittance and non-remittance households increases between 2012/13 and 2015/16.

As expected, once a control variable for the share of children who are not in school due to supply-side issues is added in column 2, the interaction term (remittance x post) in Table 2 turns significant at the 5% level with a p-value of 0.029. However, the coefficient is difficult to interpret because the sample used in Table 2 includes households that only received remittances in 2012/13 or in 2015/16. Hence, the interaction term is equal to 1 for households that received remittances across both periods and households that only received remittances after the economic shock. Similarly, the control group includes households that received no remittances with households that only received remittances in the pre-period.

To understand what drives the treatment effect, Table 3 reports the change in the mean share of school-aged children in school in 2012/13 and 2015/16 for households that receive remittances across both periods, households that receive remittances in the pre-period but not in the post-period, households that receive remittances in the post-period but not in the pre-period and households that do not receive remittances in either period. Caution is required when interpreting these results because they do not control for the share of children affected by supply-side issues.

Table 3:
Changes in school attendance across groups

	Mean share of school-aged children in school		
	2012/13	2015/16	Change
Remittances in wave 2 and 3	0.78	0.79	+1%
No Remittances	0.77	0.67	-10%
Remittances in wave 2 not 3	0.93	0.91	-2%
Remittances in wave 3 not 2	0.85	0.74	-11%

Source: The World Bank Microdata Library, 2020b and 2020c

Table 3 confirms my hypothesis, households that receive remittances across both periods have roughly the same % of children in school across both periods, while households that do not receive remittances have a declining share of children in school. However, it is difficult to understand what drives the change in schooling among households that only receive remittances in one period. There is no information about why some households have the migrant return home and why others send someone to work abroad once the economic decline started. Therefore, it is difficult to say why households that receive remittances in wave 3 show a strong decline in schooling, while households that only receive remittances in wave 2 do not. Consequently, I restrict the sample to households that receive remittances across both periods (treatment) and households that never receive remittances (control) in the subsequent regressions.

Difference-in-Differences Results: Restricted Sample

Table 4 shows that once I restrict the sample to compare households that receive remittances in the pre and post period to households that never receive remittances, the interaction term is statistically insignificant both with and without controlling for educational supply-side issues.

Table 4:
Regression Results Restricted Sample

Dependent variable:	Share of school-aged children in school	
	(1)	(2)
Post	-0.086	-0.147
	(10.48)***	(20.20)***
Remittance x Post	0.119	0.109
	(1.25)	(1.35)
Share of school-aged children affected by supply-side issues		-0.504
		(24.93)***
Constant	0.767	0.855
	(192.63)***	(188.98)***
R^2	0.04	0.25
Observations	5,802	5,802
Household fixed effects	Yes	Yes

t-statistics in parentheses
Significant at * 10%, ** 5%, *** 1% levels.

Source: The World Bank Microdata Library, 2020b and 2020c

It is interesting to explore whether splitting the sample into urban and rural changes the result because Calero et al. (2009), who also investigate the mitigating effect of remittances on schooling, find that in Ecuador the effect is greater in rural areas than in urban areas. They explain this by rural households' higher exposure to shocks and greater liquidity constraints. Although my analysis looks at the effect of an economic shock as opposed to idiosyncratic shocks, natural disasters and agricultural shocks like Calero et al. (2009), it seems likely that the treatment effect is also larger in rural areas in the context of Nigeria. The reason for this is as follows. In Nigeria, rural households face on average greater liquidity constraints than urban households, therefore, they are far more likely to struggle to smooth consumption if they are affected by income volatility. A World Bank document reporting on findings from the general household survey wave 1 to 3, the same data that is used in this study, states that in Nigeria "an estimated 64 percent of all poor live in rural areas" (The World Bank, 2017, p. 2). Furthermore, it highlights that "the recent economic slowdown appears to have disproportionately affected the rural population", with rural poverty reaching a staggering 52% and urban poverty remaining steady at 16% (The World Bank, 2017, p. 2). Remittances primarily affect a household's decision of whether to send their child to school or not by reducing a negative income effect. Hence, they are likely to make

a difference if increased poverty explains the decline in schooling, not if another factor drives the decrease in education. Supporting this prediction, Bucheli et al. (2018) find that in Ecuador remittances positively affect education of children from relatively poor families, while having no or an insignificant impact on education of children from wealthier backgrounds. This is because the negative effect of parents' absenteeism is likely to outweigh the benefits of increased income if families are relatively well-off. Therefore, it is reasonable to expect that in Nigeria the mitigating effect of remittances is concentrated among rural households for whom liquidity constraints are more binding.

Table 5 column 1 reports the difference-in-differences analysis controlling for supply-side issues and household fixed effects for the urban sample and column 2 reports the same regression for the rural sample.

Table 5:
Regression Results Restricted Sample: Rural/Urban

Dependent variable:	Share of school-aged children in school	
	(1)	(2)
Post	-0.097	-0.161
	(7.30)***	(18.09)***
Remittance x Post	-0.124	0.210
	(1.31)	(2.04)**
Share of school-aged children	-0.645	-0.496
affected by supply-side issues	(13.45)***	(21.72)***
Constant	0.911	0.835
	(138.76)***	(142.57)***
R^2	0.31	0.24
Observations	1,566	4,236
Household fixed effects	Yes	Yes
Restricted Urban	Yes	
Restricted Rural		Yes

t-statistics in parentheses
Significant at * 10%, ** 5%, *** 1% levels.

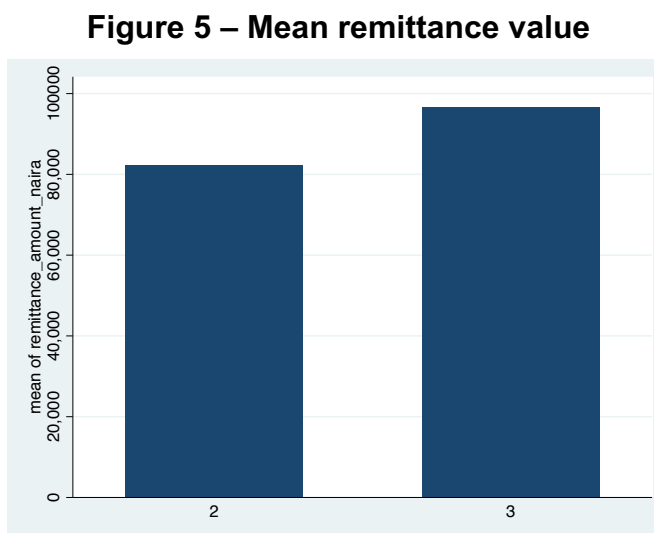Source: The World Bank Microdata Library, 2020b and 2020c

Supporting the idea that the mitigating effect of remittances is concentrated in rural areas, the interaction term turns statistically significant at the 5% level once the sample is restricted to rural households and the coefficient is twice as large compared to the sample that includes both rural and urban households. The coefficient on the

interaction term shows that the negative effect of the economic decline on school attendance is 21% less severe for remittance-receiving households compared to households that receive no money transfers from abroad. This implies that households that receive remittances are better able to invest in their children's education during the economic decline compared to households that do not receive remittance. Overall, the findings mirror evidence from Calero et al. (2009, p.1151) who find that in Ecuador remittances "relax households' budgets constraints such that it can lead to increased investment in education, and that reducing investment in children's education is generally not considered as a coping mechanism by households when faced with unexpected income shocks; at least not in the short term." It is also in line with their finding that the insurance effect of remittances is greater in rural areas than in urban areas.

Potential mechanism: Informal Insurance Agreement

The results from the difference-in-difference analysis confirm that in rural Nigeria remittances help households to cope with shocks, increasing the probability that their children attend school. However, it is impossible to know if the mechanism that explains why remittances help households insure against risks is indeed the hypothesised insurance agreement between migrants and recipient households. There are various motives for migrants to remit and it can be very hard to differentiate among them because they frequently predict similar outcomes. The most widely cited explanations for remittance patterns include individual motives, such as altruism, exchange reasons or inheritance motives, and implicit familial contracts on investments or insurance. Without knowing the migrants' and recipients' incomes and the exact timing of transfers, information that is not available in the GHS data, it is impossible to conduct formal tests to differentiate between various motives (Rapoport and Docquier, 2006). However, the pattern in the remittance data before and during the economic shock can provide some indication of the underlying mechanism. Since remittances can be affected by macroeconomic conditions in the home country, it is possible to look at changes in the average remittance amount to better understand why migrants remit (Vargas-Silva and Huang, 2006). The insurance motive, as described in section two, predicts that remittance amounts should be higher if recipient households experience shocks (Gubert, 2002).

In line with insurance motive, the change in the mean remittance amount among recipient households with school-aged children in the restricted sample shows an increase in the value of remittances during the economic decline. In 2012/13 (wave 2), the mean remittance amount is 82 207 Naira (517US$) and in 2015/16 (wave 3), it is 123 374 Naira, which is equivalent to 96 602 Naira (608 US$) after adjusting for the high inflation between 2012 and 2015 using the change in CPI (as illustrated in Figure 5). The increase in the remittance amount between 2012/13 and 2015/16 is not driven by the stark depreciation of the Naira in 2016 because Nigeria's Central Bank only removed the peg from the dollar in June 2016 and data collection ended in April 2016 (Ono and Elliott, 2016). Since the remittance question referred to remittances received within the past year, the 2015 average exchange rate is chosen to convert remittances reported in foreign currencies.

Figure 5 – Mean remittance value

Source: World Bank Microdata Library, 2020b/c for remittance values, The World Bank, 2020c for the change in CPI and exchangerates.org.uk. for average yearly exchange rates

However, further restricting the sample to rural households since the treatment effect is concentrated among rural families, leads to a puzzling result. In nominal terms the mean remittance amount still increased from 62 265 Naira (392US$) to 73 431 Naira between wave 2 and 3. Yet, adjusting for the 28% inflation, shows a decline in remittances to an average amount of 57 496 Naira (362 US$) in wave 3. Since I compare changes in mean remittances values and the sample is extremely small once I restrict it to rural households that received remittances across both waves (N=13)[2], outliers can heavily skew estimates. A closer look at each rural household in the restricted sample shows that the relatively low mean remittance value in 2015/16 is driven by four households who received remittances from fewer migrants in 2015/16 than in 2012/13. Given the small sample size and the fact that there is no data as to

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[2] One household had to be excluded because no remittance values were reported.

why some households received remittances from fewer migrants in 2015/16 than before, it is difficult to draw conclusions from these estimates.[3]

Hence, the available evidence for the restricted rural sample is inconclusive, but it does not negate the insurance mechanism per se. Migrants might have an informal insurance agreement with their families but may be unable to increase remittances sufficiently to outweigh Nigeria's high inflation. In Nigeria education quality is drastically worse in rural areas compared to urban areas, so it seems reasonable to assume that rural migrants are less skilled, on average (Uzobo et al., 2014). With less skills, it is likely that they earn lower wages in host countries and that it is more difficult for them to increase remittances during shocks, even if they wanted to. For example, Gubert et al. (2009) find that in Mali migrants from rural areas are less skilled than migrants from urban areas, making it harder for them to send high remittances as they tend to earn lower salaries in destination countries.

To better understand if the insurance role of remittances explains the treatment effect, it is helpful to compare the possibility of an insurance agreement to alternative explanations for remittances. The exchange motive predicts that migrants remit to "pay" for a service like childcare or property maintenance. The exchange model assumes that the remittance amount depends on each party's relative bargaining power. An increase in unemployment at home is predicted to decreases the transfer received because the high unemployment rate reduces the recipient's bargaining power relative to the migrant (Cox et al., 1998). Since in Nigeria unemployment increased during the economic decline (Benson, 2018) and remittances in the aggregate restricted sample increased since 2014, the exchange motive is unlikely to apply. Another explanation for remittances can be inheritance. The inheritance motive predicts that migrants view remittances as an investment to secure inheritance, while the remittance-receiving household uses inheritance to compel migrants to send regular payments (de la Brière et al., 2002; Hoddinott, 1994). Rapoport and Docquier (2006) argue that if inheritance prospects explain remittances, shocks should have no direct effect on remittances. Given the increase in remittances observed in the restricted sample, it also seems unlikely that inheritance is the primary motive. The familial investment agreement is essentially a family loan arrangement with the

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[3] For detailed information please see Appendix 3.

underlying goal of increasing family income. Usually, migrants are expected to remit to repay families for investments into their education and/or migration expenses. The investment motive can potentially explain an increase in remittances during an economic decline because an increase in unemployment raises the relative value of education, which might pressure migrants to remit higher amounts, so that their families can invest into their children's education (Stark and Bloom, 1985). While this is possible, the value of education is unlikely to change significantly if the crisis is expected to be temporary.

Having considered several possible explanations, it seems most likely that an implicit familial insurance agreement in combination with some degree of altruism, as described in section two, explains why rural remittance-receiving households were better able to mitigate against the economic decline than households that did not receive remittances. Stark and Bloom (1985, p.915) point out that "pure" altruism is usually insufficient to explain migrants' incentive to remit and "tempered" altruism, which combines a familial agreement with some degree of altruism, does better at explaining empirical patterns (Stark and Lucas, 1988; Lucas and Stark, 1985).

Robustness Checks

Placebo Test

Placebo tests can be used to test the parallel trend assumption. If data is available for at least two time periods prior to the treatment, it is possible to estimate a treatment effect before the actual treatment took place and if the results are insignificant, one can infer that treatment and control groups followed common trends (Angrist and Pischke, 2009; Lechner, 2011). Two placebo tests are conducted comparing data from wave 1 (2010/11) and wave 2 (2012/13). The first test uses an unrestricted sample as in Tables 1 and 2 and the second test restricts the sample to exclude households that only received remittances in either wave 1 or wave 2. Between 2010/11 and 2012/13 economic growth remained relatively high ranging between 4.3 and 8%, as illustrated in Figure 2. Macroeconomic data shows that both primary and secondary school enrollment (% gross) increased during these pre-periods, contrary to the decrease after the economic decline (UNESCO Institute for Statistics, 2020). Figure 3 shows that the GHS data also reflects the increase in schooling between wave 1 and wave 2.

Table 6:
Regression Results Placebo Test Unrestricted Sample

Dependent variable:	Share of school-aged children in school	
	(1)	(2)
Remittance	0.028	0.067
	(0.44)	(1.11)
Post	-0.009	0.069
	(1.15)	(10.06)***
Remittance x Post	0.075	0.007
	(1.00)	(0.11)
Share of school-aged children		-0.522
affected by supply-side issues		(22.65)***
Constant	0.762	0.781
	(197.32)***	(211.35)***
R^2	0.00	0.21
Observations	6,509	6,509
Household fixed effects	Yes	Yes
t-statistics in parentheses		
Significant at * 10%, ** 5%, *** 1% levels.		
Source: The World Bank Microdata Library, 2020a and 2020b		

Table 6 reports the results of the placebo regressions using the unrestricted sample and shows that the interaction term remains statistically insignificant with and without controlling for educational supply-side issues. Table 7 shows the results of the placebo regressions using the restricted sample. Restricting the sample also does not show a statistically significant difference in the change in schooling across remittance and non-remittance households between 2010/11 and 2012/13. These results stand in stark contrast to the pattern observed during the economic decline, supporting the claim that in absence of an economic shock, schooling for remittance and non-remittance households would have followed parallel trends.

Table 7:
Regression Results Placebo Test Restricted Sample

Dependent variable:	Share of school-aged children in school	
	(1)	(2)
Post	-0.009	0.069
	(1.21)	(9.98)***
Remittance x Post	0.015	-0.024
	(0.16)	(0.31)
Share of school-aged children affected by supply-side issues		-0.520
		(22.52)***
Constant	0.764	0.783
	(204.24)***	(217.81)***
R^2	0.00	0.21
Observations	6,264	6,264
Household fixed effects	Yes	Yes

t-statistics in parentheses
Significant at * 10%, ** 5%, *** 1% levels.

Source: The World Bank Microdata Library, 2020a and 2020b

6. Limitations and Avenues for Future Research

There are several limitations relating to the analyses above that are important to mention. A key concern is whether my analysis allows for causal inference. Using a difference-in-differences approach and controlling for the share of children affected by supply-side issues, which may otherwise confound the results, support a causal interpretation. However, most importantly causality rests on the parallel trend assumption. The placebo test in section five showed that remittances had no effect on schooling between wave 1 and wave 2, which is no direct test of the parallel trend assumption but lends credibility that treatment and control group would have followed parallel trends absent of an economic shock.

Nevertheless, the reliability of the results is weakened by the small size of the treatment group once the sample is restricted to exclude households that only received remittances in wave 2 or wave 3. After restricting the sample, only 30 remittance-receiving households remain, of which just 24 households have school-aged children and are thus included in the analysis. When splitting the sample into rural and urban households, the sample size of the treatment group further decreases to 14 rural

households and 9 urban households who receive remittances across both waves. One household was located in an urban area before the economic decline and in a rural area afterwards and must therefore be excluded once the sample is split into urban and rural areas. Findings reported in section five must be interpreted with this limitation in mind. It would be extremely valuable to replicate the research design with a larger data set that records more remittance households and is thus more representative of the wider remittance-receiving population when restricting the sample.

External validity might also be limited given that the paper focuses on only one shock in one country. While this improves the internal validity of the analysis, it compromises the degree to which the results from this study apply to other settings. The fact that Calero et al. (2009) find similar results, despite using an instrumental variable approach, looking at different types of shocks and focusing on a different country, provides some assurance that a similar effect might be observed in other credit constrained countries. Nonetheless, some aspects of the findings need to be interpreted keeping the local context in mind. For example, this study finds the treatment effect to be concentrated in rural areas because rural poverty in Nigeria is far greater than urban poverty and the economic shock affects rural households disproportionally strong (The World Bank, 2017). In other countries, urban households might face greater liquidity constraints than rural households and, therefore the opposite may be true.

Another limitation is that the proposed mechanism underlying the treatment effect is not formally tested, although some indicative evidence is presented. Testing more formally whether the informal insurance mechanism explains why remittance households are more likely to have their children in school during economic shocks is beyond the scope of this study. An interesting direction for future research would be to ask households why they received higher remittances following the economic shock to understand if the increase in remittance amounts during the economic decline was driven by an implicit familial insurance agreement or influenced by another reason.

Lastly, it is important to highlight that the dependent variable, the share of school-aged children in school, includes children of both primary and secondary school age, but remittances might have a different effect depending on whether children are younger

or older. For example, remittances may decrease child labour among younger children by increasing family income, thus reducing the necessity to rely on children's work. However, for older children, remittances might be correlated with a decrease in schooling because they might be expected to take on work that used to be done by the migrating adult (Hanson and Woodruff, 2003). This study cannot speak to these potential differences because the independent variable defines school age as 6-17 across all analyses. The independent variable also focuses on the extensive margin of schooling, namely whether the child is in school or not. The data used for the analysis does not record whether children attend private school or not, which is often used as a proxy for educational quality (Salas, 2014). If children were in school in 2012/13 and 2015/16, it is assumed that they remained in school, but parents might move their children from private to public schools to cope with the shock. It is beyond the scope of this study to test for differential treatment effects depending on the child's age and for changes on the intensive margin of education, but these are interesting research directions to explore in the context of Sub-Sharan Africa because most studies investigating these effects have focused on other geographic regions.

7. Conclusion

International remittances have become increasingly important for Nigeria's economy, increasing from $8.15 billion to $17.57 billion between 2014 and 2018 alone, a period when other sources of financial inflows, such as FDI or FPI, have dropped significantly (Adesoji, 2020). Yet, the developmental role of remittances has remained vastly unexplored, despite their potential in improving school attendance and reducing households' exposure to economic volatility. By analysing whether international remittances helped recipient households to uphold human capital investments during the economic decline following the 2014 drop in the oil price, this paper examined two potential benefits associated with remittances.

By using a difference-in-differences approach with household fixed effects, this study found that households that received remittances in 2015/16 were more likely to have their children in school during the economic shock than households that did not. However, it was difficult to understand what caused this effect because the interaction term (remittance x post) was equal to one for both households that only received remittances in 2015/16 and households that receive remittances across both periods,

and equal to zero for both households that only received remittances in 2012/13 and households that never received remittances. To gain a better understanding of the difference in households that received remittances across both periods compared to households that never did, the sample was restricted to exclude households that only received remittances in one period. At first, the restricted sample showed no statistically significant effect. However, splitting the sample into urban and rural households showed that the negative effect of the economic decline on schooling was 21% smaller for rural remittance-receiving households compared to non-recipient households. Whilst this estimate needs to be interpreted with caution due to the small size of the treatment group, this finding mirrors evidence from Calero et al. (2009), who study a similar research question in the context of Ecuador.

Since the economic decline in Nigeria has primarily increased rural poverty, with at least one in two individuals in rural areas now living in poverty (The World Bank, 2017), remittances seem to have played a particularly important role in reducing liquidity constraints among rural households. In absence of a functioning credit market, poor households are often unable to cope with shocks, and are forced to sacrifice their children's education if their income drops (Ferreira and Schady, 2008). International remittances can offer a stable source of revenue during economic volatility and may even represent an informal familial insurance agreement between migrants and their families (Gubert, 2002; Lucas and Stark). Given the lack of available data, I could not formally test whether an informal insurance agreement explains why rural remittance-receiving households were able to mitigate the negative effect of an economic shock on schooling. However, after discussing the likelihood of alternative explanations, I concluded that it appears likely that Nigerian migrants remit for insurance purposes in combination with some level of altruism.

The findings of this study have several policy implications. Firstly, given the role of remittances in reducing liquidity constraints and vulnerability to economic shocks, it is crucial that transfer costs are lowered to maximise benefits. According to the SDG 10, costs of transferring money to developing countries should be reduced to 3% by 2030 (United Nations Statistics Division, 2020). Yet, transfer costs to Sub-Sharan Africa are still averaging 9.4% in 2018 (Ratha et al., 2018). To reduce costs, it is necessary to increase market competition and facilitate the adoption of new technologies such as

mobile money. Secondly, it is important to improve data collection on remittances. As highlighted by this study, household surveys can provide valuable insights into the microeconomic effects of remittances, but to provide reliable estimates, it is necessary to record a larger number of remittance-receiving households. Since only few households receive remittances from abroad on a regular basis, it is necessary to strongly increase sample sizes or to create surveys specifically designed to collect remittance data. Thirdly, it is important that Nigeria's government and international donors recognise and address the severe implications of a sharp decline in remittances due to Covid-19. Given the global nature of the current crisis, remittances are unlikely to help households cope with domestic income shocks to the same extent as usual, leaving many households vulnerable as Nigeria faces its worst recession in 40 years (The World Bank, 2020b; Bisong et al., 2020).

Overall, the findings of the study contribute to the literature in several meaningful ways. Firstly, its findings mirror the results of Calero et al. (2009) despite using a different estimation technique, namely a difference-in-differences method as opposed to an instrumental variable approach, looking at a different type of shock and at a different region. This contributes to the external validity of a vastly unexplored research field. Secondly, this study adds to the literature on the role of remittances in Nigeria (Fonta et al., 2015; Anyanwu and and Erhijakpor, 2007; Akanle and Adesina, 2017; Chukwuone et al., 2012), by analysing the insurance role of remittances with respect to schooling, a yet unexplored aspect in the context of Nigeria. More broadly speaking, this dissertation contributes to the literature that discusses how international remittances positively affect a country's development, both by insuring households against shocks and by increasing human capital investments.

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Appendix 1: Data Sources

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Appendix 2: Variable Descriptions

Variable	Description	Constructed using the following variables:
Dependent variable		
Share of school-aged children in school (denoted *sharechildr_school*)	Using answers to s1q4 I created a dummy variable equal to 1 if the individual is of school age (6-17). Using the school age dummy and s2aq13 I created a dummy equal to one if the individual is of school age and in school in the year 2012/13 or 2015/16. Based on the dummy variable that indicated whether the individual is of school age or not, I created a variable reflecting the share of school-aged children per household. Then, I was able to estimate the share of school-aged children in school for each household.	s2aq13: IS [NAME] PRESENTLY IN SCHOOL (2012-2013/2015-2016 SCHOOL YEAR)? s1q4: AGE IN COMPLETED YEARS
Independent variables		
Remittance (denoted *remittance)*	Dummy variable set equal to 1 if at least 1 member of the household (same hhid) answered "1.YES" to question s6q2, 0 otherwise.	s6q2: DID [NAME] RECEIVE A MONETARY ASSISTANCE FROM ABROAD IN THE PAST 12 MONTHS?
Post (denoted *post*)	Dummy variable set equal to 1 for wave 3 data and equal to 0 for wave 2 data. In the placebo tests post is equal to 1 for wave 2 data and equal to 0 for wave 1 data.	n.a.
Remittance x Post (denoted *interaction*)	Dummy variable set equal to 1 if both remittance and post are equal to 1.	n.a.
Control variable		
Share of school-aged children not in school due to supply-side issues *(denoted sharechildr_supplyside)*	I created a dummy set equal to 1 if the answer to s2aq14 is "2. AWAITING ADMISSION" or "3. NO SCHOOL/LACK OF TEACHERS". Then, I used the variable share of school-aged children per household to estimate the share of school-aged children not in school due to supply-side issues for each household.	s2aq14: WHY IS [NAME] NOT CURRENTLY IN SCHOOL?

Appendix 3: Remittance Trends

RURAL SAMPLE	HHID	NAIRA BEFORE	NAIRA AFTER	MIGRANTS BEFORE	MIGRANTS AFTER
	40054	230000	70000	3	2
	40060	110000	100000	4	2
	40109	50000	150000	1	1
	40130	40000	100000	1	1
	40197	10000	100000	1	1
	90062	12000	10000	1	1
	160095	180000	150000	3	2
	160184	10000	10000	1	1
	160188	47700	9900	1	1
	230073	40000	150000	2	2
	250066	15000	25000	1	1
	280054	25000	50000	2	1
	320161	39750	29700	1	2
Excluded:	160174	.	.	(missing)	
	Total:	809450	954600		
	Mean:	62265	73431	57496 (inflation adjusted)	

URBAN SAMPLE	HHID	NAIRA BEFORE	NAIRA AFTER	MIGRANTS BEFORE	MIGRANTS AFTER
	120015	108000	20000	1	2
	120021	61200	50000	1	1
	120087	30600	80000	1	1
	130013	10000	20000	1	1
	240061	79500	198000	1	1
	240086	600000	1220000	1	4
	240142	100000	170000	1	1
	280105	65000	25000	2	1
	290124	10000	70000	1	1
	Total:	1064300	1853000		
	Mean	118256	205889	161211 (inflation adjusted)	
Excluded:	270023	(moved from urban to rural)			

Consumer Price Index Nigeria (=2010):
- 2012: 124.382
- 2015: 158.939
- 2018: 240.143

124.382/158.939=0.783
124.382/240.143=0.517

Sources:
- Exchange Rate Data: Exchangerates.org.uk. 2020. *Exchange Rates UK - Compare Live Foreign Currency Exchange Rates*. [online] Available at: <https://www.exchangerates.org.uk/> [Accessed 1 August 2020].
- CPI: The World Bank, 2020c
- Remittance data: The World Bank Microdata Library, 2020b and 2020c