Household shocks and child labor: Evidence from a panel survey of Nigerian households

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Abstract: This paper studies the effect of household shocks on child labor and school enrollment. We use data from a two-year panel dataset of Nigerian households surveyed between 2010/2011 and 2012/2013. We find that agricultural shocks, measured as crop and livestock losses, increase child labor hours and decrease the probability that a child will enroll in school. We also find that health shocks to men increase child labor hours. In contrast, health shocks to women have no impact on child labor hours and school enrollment

## 1.    Introduction

The relationship between household income shocks and risk-coping strategies has long been of interest to economists (Dercon, 2000).   Households draw down on savings, sell assets, diversify crop portfolio, borrow, use formal insurance or adjust labor supply to mitigate the effect of negative income shocks.  A growing body of literature suggests that in the absence of formal insurance and credit markets, households increase child labor or decrease investments in child education in response to household shocks (Beegle et al 2006, Dillon, 2007).  Although several papers exist on the determinants of child labor, few papers study the impact of household shocks on child labor and school enrollment.  The objective of this paper is to examine the impact of household shocks on child labor and school enrollment.  We measure household shocks using two indicator variables. The first measure of shocks is crop and livestock losses due to weather, insects, pests and diseases.  The second measure of shocks is parental illness and illness to other household members that causes individuals to stop their usual activities.

Agriculture shocks are a major cause of variations to household income in developing countries (Burke et al 2014).  The agricultural sector in Sub-Saharan Africa employs more than half of the labor force and contributes 35 percent of gross domestic product. Despite its importance, the sector continues to be met with shocks including climate change, natural disasters, volatility of commodity prices and regional conflicts (Chuku and Okoye, 2009). Faced with income constraints due to agriculture shocks, households may be forced to send their children to the labor market in order to supplement household income.

Health shocks are unpredictable shocks that severely affect household income (Gertler and Gruber, 2002).  There are two economic costs associated with health shocks.  First, health shocks decrease household income through medical costs used to treat illness. Second, health

shocks decrease the ability to work reducing labor supply and productivity. In the absence of a formal health and disability insurance, households may use several coping strategies to smoothen consumption from the income shock of illness. The literature suggests that households may cope with the impact of health shocks using labor substitution (Sauerborn, et al., 1996). Bazen (2010) finds that parental health shocks increase the labor force participation of children. When parents are ill households may use child labor to offset income loss.

This paper seeks to contribute to the literature by providing additional evidence on the impact of different household shocks on child labor. We use data from a two-year panel data of Nigerian households surveyed between 2010/2011 and 2012/2013. The data provides detailed information on the time use of individuals aged 5 years and older. The data also provides detailed information on household shocks as well as on the year the shocks were experienced. We use a random effects specification to control for household heterogeneities. We also include a host of child and household characteristics in the analysis.

The rest of the paper is organized as follows. The next section discusses the background and literature review. Section 3 describes the data, followed by Section 4 on empirical methodology and results. Section 5 concludes.

## 2.	Background and Literature Review

Nigeria is the most populous country in Africa and has a population of 160 million. In April 2014, the country overhauled its GDP making it the largest economy in Africa. In the 1970's, the country enjoyed an oil boom and this led to a neglect of various sectors of the economy including the agriculture sector. Nigeria is the 13th largest producer of oil in the world and despite the country's wealth in oil and natural resources, poverty continues to be widespread in

the country.  Indeed, the World Bank estimates that over 70% of the population lives on $1.25 or less a day.

A report by the United States Department of Labor (DOL) indicates that in the year 2014, Nigeria made moderate advancement to eliminate child labor.[1] While this is a laudable achievement, estimates from the International Labor Organization (ILO) indicate that the country still has a high incidence of children in economic activity and lags behind other countries in the elimination of child labor.  The 2014 DOL report on child labor indicates about 31 percent of children between the ages of five and fourteen years are engaged in child work.

Poverty is widely viewed as the main cause of child labor.  The seminal work by Basu and Van (1998) indicates that "a family will send the children to the labor market only if the family's income from non-child-labor sources drops very low" (Basu & Van, 1998; page 416). Children in Nigeria are engaged in the worst forms of child labor. Children are engaged in forced labor in various sectors of the economy.  In Northern Nigeria, for example, children who are sent by their parents to receive Koranic education in urban areas are forced to beg on the streets by their teachers.  These children are also forced to surrender the monies they collect to their teachers. Further, children are also trafficked to work as domestic servants as well as in other sectors of the economy including agriculture and mining.

Also, widespread poverty and unemployment has created the atmosphere where children are susceptible to participate in armed conflict. A typical example is the terrorist group Boko Haram

1. According to the United States Department of Labor, a country is deemed to have made moderately advanced efforts in eliminating the worst forms of child labor in 2012 if it took suggested actions or made other meaningful efforts in some relevant areas covering laws and regulations, coordination and enforcement, policies, and social programs to eliminate child labor.

that recruits child soldiers to fight and plant bombs. The government of Nigeria has implemented several policies towards eliminating child labor in the country. However, enforcement of laws remains a major problem in the country.

There are several factors that determine child labor. Key among them include child characteristics, poverty, household characteristics and imperfect credit and insurance markets. On the impact of household shocks on child labor and school enrollment, three different types of shocks are studied – death, illness and agricultural shocks. Beegle et al (2006) use data from a household panel survey in Tanzania to examine the impact of household income shocks on child labor. The authors measure household shocks as crop losses due to pests and other calamities. The authors find that crop shocks lead to an increase in child labor. The authors indicate that households with durable assets are more likely to take loans to mitigate the impact of an agricultural shock.

Bandara et al (2014) also use data from Tanzania to examine the impact of income and non-income shocks on child labor. The authors find that agricultural shocks lead to an increase in overall work hours as well as on the agricultural work hours of children. The authors also examine if access to credit is able to mitigate the impact of agricultural shock. The results indicate that access to a bank account decreases the number of hours worked by girls. The authors do not find any significant evidence that access to a bank account decreases the number of hours worked by boys.

Dillon (2007) use data from Mali to examine the impact of production and parental health shocks on child labor and school enrollment. The author finds that production shocks, measured as harvest pest infestations, causes household to withdraw their children from school. Large production shocks lead to an increase of 3 hours in weekly child work while small production

shocks lead to an increase of 2 hours in child work. On the impact of health shocks, the author finds that health shocks to women increase the probability that a child will work in the family business as well as in childcare activities.

Dendir (2007) examines the impact of household shocks on the incidence and intensity of child labor using data from Malawi. The author measures household shocks as the incidences of death, illness and accident in a household. The author finds that household shocks have no impact on child labor. However, the author notes that further estimation results indicate that child labor decreases with some shocks. The author explains that this could be due to an overall decrease in economic activity for households that are dealing with death or sickness of members. Alam (2015) also examines the impact of parental illness on children's education. The author finds that illness to a father decreases children's school attendance. The author also indicates that long-term illness to a father has long term consequences on the child as it decreases the likelihood that the child will complete primary school and also leads to fewer years of schooling. The author also finds that the illness to a mother have no impact on school enrollment.

Case et al (2005) use panel data from KwaZulu-Natal in South Africa to examine the impact of parental death on children's outcomes. The author finds that death to a mother has significant impact on schooling outcomes. Specifically, the authors find that maternal death decreases the likelihood that a child will be enrolled in school. The authors also find that maternal death leads to a decrease in the number of years of completed schooling to the orphaned children. In addition, less money is spent on the education of orphaned children conditional on their enrollment. The authors also find that death of a father is correlated with poorer school outcomes.

## 3. Data

This paper uses a two-year panel data set from the Nigeria General Household Survey (GHS). The first wave of the data was collected from August 2010 to April 2011 and the second wave of the data was collected from September 2012 to April 2013. Each wave of the survey consists of a post-planting visit and a post-harvest visit. The survey is the result of a partnership with the Nigeria National Bureau of Statistics, Federal Ministry of Agriculture and Rural Development, the National Food Reserve Agency, the Bill and Melinda Gates Foundation, and the World Bank. The GHS panel is part of a regional project in Sub-Saharan Africa aimed at improving statistics on agriculture.

The first wave of the GHS panel data consists of 4,916 households and 27,588 individuals selected from a representative sample of both urban and rural areas. The second wave of data consists of 4,716 households and over 95% of households were re-interviewed in the second wave. Each wave of the data set consists of a household questionnaire, agriculture questionnaire and a community questionnaire. The household questionnaire provides information on household demographics, education, health, labor, food and non-food expenditure, household non-farm income-generating activities; food security and shocks; safety nets; assets; information and communication technology; and other sources of household income. The agriculture questionnaire provides information on household land ownership and animal holdings, household farm labor, agriculture capital and household fishing activities. The village questionnaire provides information on access to infrastructure, community organizations, community key events and local retail price information.

We limit the sample to children between the ages of 6 to 15 living in households where at least one adult household member is engaged in agriculture. We select this sample because

agriculture shocks are relevant to households engaged in agricultural production.  We choose a start age of 6 years because this is the official age to start school and an ending age of 15 years because this is the age that children complete primary schooling if they are enrolled on time. The sample consists of 7,429 children in the first wave and 8,172 children in the second wave.

The outcome variables of interest are agricultural work in hours and school enrollment. We construct agricultural work hours using information from the survey on the number of hours worked in agricultural labor in a week.  The survey also provides information on the current school enrollment status as well as the previous school enrollment status for each child. School enrollment is an indicator variable that equals one if a child is currently enrolled in school and zero otherwise.

We measure agriculture shocks as crop and livestock losses due to weather, pests, insects and diseases.  This variable is a dummy variable that equals one if a household experienced crop or livestock loss due to agricultural shocks one year prior to the survey and zero otherwise. We measure health shocks using two questions from the survey. The first question reads "during the past 4 weeks have you suffered an illness or injury?" The second question reads "Did you have to stop your usual activities in the past 4 weeks because of this condition?" Health shocks equals to one if an individual's answer is "yes" to both questions and zero otherwise.

We include in the model a host of child and household characteristics. Child characteristics include age, relationship to head of the household and school enrollment status. Household characteristics include household size, parental age and education, and household food expenditure to proxy for household income.  Table 1 shows the percentage of households that experienced a health and agricultural shocks for each of the 36 states in Nigeria. Households in Kaduna state experienced the most agricultural shocks. About half of household

indicated to have experienced an agricultural shock one year prior to the survey. A third of households surveyed in Abuja state experienced a health shock that prevented them from being able to carry out their daily activities one year prior to the survey.

Table 2 displays summary statistics for the variables used in the model. On average, a child works 9 hours per week in agricultural labor in both waves of the survey. The average age of mothers is 48 and the average age of fathers is 50 years. Thirty-three percent of all households in the survey indicated to have experienced an agricultural shock. Thirty-seven percent of mothers and 30 percent of fathers experienced a health shock that prevented them from been able to carry out their daily activities. About thirty-two percent of children experienced a health shock. Sixty percent of children are currently enrolled in school conditional on the fact that they were enrolled in school in the previous year. The average household size is eight. About half of mothers and fathers have primary education.


## 4.      Empirical Methodology and Results

The objective of this paper is to examine the impact of agricultural shocks and parental health shocks on child labor and school enrollment. We use the following estimation equation:

$$L_{ijt} = B_0 + \beta Shock_{ijt} + B_i X_{ijt} + c_j + e_{ijt} \qquad (1)$$

Here, $L_{ijt}$ is the outcome variable of interest and represents child work hours or school enrollment for individual i in household j at survey round t (t = 1, 2). $X_{ijt}$ is a vector of control variables for individual and household characteristics. $Shock_{ijt}$ is a dummy variable where 1 represents a child living in a household that experiences an agricultural shock or a health shock and 0 otherwise. Health shocks are disaggregated into men's illness and women's illness. We include in the regression household-specific effects, $c_j$. This allows us to control for unobserved household

heterogeneity that could lead to biased results. If a household shock leads to an increase in children's work hours, the variable $\beta$ will be positive and significant. Also, if a household shock leads to a decrease in school enrollment, the variable $\beta$ will be negative and significant. We estimate Equation 1 for the full sample and for a stratified sample of boys only and girls only.

### 4.1 Exogeneity or Endogeneity of Shocks

As indicated by Beegle et al (2006), it is possible that the measure of household shocks may not be exogenous. Shocks will be endogenous if they are correlated with household and individual characteristics such as parental education. To investigate this potential endogeneity problem, we regress the probability that a household experiences agricultural and parental health shocks on household and individual characteristics. If the coefficients for education and household wealth are significant, then shocks are correlated with household characteristics and are endogenous.

### 4.2 Results

We first examine whether household shocks are exogenous. If the coefficients for parental education and proxy for household income are significant, this will imply that agricultural shocks are correlated with household and individual characteristics. In that case, the results for the impact of shocks on children's labor and school enrollment will be biased. We find (estimation results not shown here but available upon request) that the coefficients on parental education as well as the log of household food expenditure are insignificant for both agricultural shock and parental health shock. However, we find that the coefficient for household size is significant. Considering that the key concern is whether agricultural shocks may be

correlated with household education and income, we conclude that agricultural and health shocks are not correlated (endogenous) to household and individual characteristics.

**4.2.1 Impact of shocks on child labor and school enrollment (full sample)**

Table 3 shows the full-sample regression results for the impact of shocks on child work and school enrollment. The dependent variable in column 1 is child work in hours. We estimate column 1 using a random effects specification. The dependent variable in column 2 is school enrollment. School enrollment is a binary variable that takes a value of 1 if a child is currently enrolled in school conditional on the fact that they were enrolled in school in the prior year and zero otherwise. We estimate column 2 using a random effects probit model.

In column 1, we find a positive and significant relationship between agricultural shocks and child agricultural work hours. Agricultural shock leads to a two hours increase in the child's agricultural work per week. Comparing this magnitude to the mean agricultural work hours, implies that this shock entails a 22 percent increase in child work hours per week. An agricultural shock in the planting season may compel household members to replant crops before the end of the planting season, thereby increasing the number of agricultural work hours for children. Similarly, an agricultural shock in the harvest season may compel households to quickly harvest crops before they are totally destroyed, thereby increasing the number of agricultural hours worked by children.

On the impact of parental health shocks on child labor, column 1 indicates that illness to a father leads to one hour increase in agricultural work hours. This represents an 11 percent increase in child work hours per week compared to the mean work hours. In contrast, we find no significant relationship between illness to a mother and the child's agricultural work hours.

Column 2 of Table 3 shows the results of the impact of shocks on school enrollment. We find a negative and significant relationship between agricultural shock and school enrollment. An agricultural shock decreases the probability that a child will enroll in school. The results show no significant relationship between parental health shocks and school enrollment. Neither the mother's nor the father's illness has a significant direct impact on school enrollment.

### 4.2.2 Results of Other Control Variables

The full-sample estimation results (not shown in Table 3 for space considerations) indicate that child age is an important determinant of child work and school enrollment. We find a positive and significant relationship between child work and age of the child. The finding that older children are more likely to work is consistent with the literature. Similarly, the results also show a significant and negative relationship between child age and school enrollment. An increase in the age of the child decreases the probability that the child will enroll in school.

The results also show that parental education is an important variable that determines child work and school enrollment. Mother's education increases the probability that a child will enroll in school and decreases child work hours. Similarly, father's education increases the probability that a child will enroll in school. These results suggest that education enhances parents' income-generating capability and thus reduces the need to use child labor to supplement household income.

Some household characteristics are also found to be important determinants of child work and school enrollment. The results show a negative and significant relationship between household size and child work. An increase in the number of individuals in the household decreases the number of hours a child works. This supports the hypothesis that households with

more members have more individuals to help on the farm, thereby decreasing the number of hours a child needs to work on the farm. Further, the results show that an increase in the household size decreases the probability that a child will enroll in school.

### 4.2.3 Impact of shocks on child labor and school enrollment for boys and girls

Table 4 displays the estimation results when we examine the impact of shocks on agricultural work hours and school enrollment separately for boys and girls. In column 1, we find a positive and significant relationship between agricultural shock and agricultural work hours for boys. An agricultural shock leads to a 2 hours increase in agricultural work for boys. This represents a 22 percent increase in the hours worked compared with the mean hours worked per week for boys. The results also show a positive and significant relationship between a father's health shock and agricultural work hours for boys. It appears that a health shock to the father leads to an increase in agricultural work hours by 1 hour for boys.

Column 2 of Table 4 shows the impact of household shocks on the school enrollment of boys. The results show a negative and significant relationship between agricultural shocks and school enrollment. As to be expected, an agricultural shock decreases the probability that a boy will enroll in school. We also find that both a mother's and father's illness have no impact on school enrollment.

Column 3 of Table 4 shows the impact of shocks on agricultural work hours for the girl's only sample. The results indicate that agricultural shocks lead to a one hour increase in agricultural work hours for girls. This represents an 11 percent increase compared to the mean work hours for girls. The results also show a positive and significant relationship between paternal illness and agricultural work hours for girls. A paternal health shock leads to a one hour

increase in agricultural work hours for girls. In contrast, maternal illness does not have an impact on the child work hours for girls. Column 4 of Table 4 shows the impact of household shocks on school enrollment. The results indicate that agricultural shocks decreases the probability that a girl will enroll in school. On the other hand, neither a mother's illness nor a father's illness impacts the girl's school enrollment.

### 5.  Conclusion and Policy Implications

This paper examines the impact of agricultural shocks and parental health shocks on child labor and school enrollment. We use the two rounds of data from the Nigerian General Household Survey. The results show that household shocks have significant impact on child labor and school enrollment. Given the fact that about a third of Nigerian households experienced an agricultural shock from pests, insects, diseases and poor weather, our findings suggest that it is important for government to address the resulting negative impacts on children with appropriate policies. The government can direct policies towards providing farmers access to pesticides and insecticides to help mitigate the impact of agricultural shocks. Further, governments can implement policies towards improving farming technologies for farmers. One such technology could be irrigation farming. Social protection programs which include subsidies and cash relief should also be provided to poor and vulnerable farmers in times of bad weather.

The survey indicates that a third of all households experienced a health shock that affected their ability to carry out their daily activities. The estimation results show that health shocks (especially paternal health shocks) have adverse effects on child labor and school enrollment. Thus, it is necessary to formulate policies to improve and insure children's education against the risk of parental illness.

Evidence from the literature suggests that access to credit is important in reducing child labor and improving school enrollment. Financing problems are very prevalent in several parts of Sub-Saharan Africa. The financing problems are in part due to the fact that there is asymmetric information in the credit market and it is very costly to screen applicants for credit. One way to deal with the asymmetric information and adverse selection problem is to group farmers to form strong cooperatives that will have better access to finance. We also find that parental education is an important determinant of child labor and school enrollment. Thus, policies need to be formed towards improving adult literacy and non-formal education programs for parents, so as to improve attitude towards education which will further improve the probability of children engaged in schools.

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**Table 1.  Shocks by State**

| Row Labels | Percentage of households with health shock experience in both waves of the survey | Percentage of households with agriculture shock experience in both waves of the survey |
| --- | --- | --- |
| Abia | 21.61% | 5.13% |
| Abuja | 33.98% | 27.18% |
| Adamawa | 9.88% | 22.46% |
| Akwa Ibom | 15.32% | 10.65% |
| Anambra | 9.38% | 7.41% |
| Bauchi | 8.80% | 39.69% |
| Bayelsa | 0.92% | 30.28% |
| Benue | 9.36% | 21.91% |
| Borno | 6.41% | 36.10% |
| Cross River | 14.80% | 11.84% |
| Delta | 7.48% | 8.27% |
| Ebonyi | 10.05% | 7.63% |
| Edo | 12.05% | 29.02% |
| Ekiti | 0.00% | 10.07% |
| Enugu | 9.77% | 28.45% |
| Gombe | 3.61% | 14.69% |
| Imo | 9.57% | 3.19% |
| Jigawa | 17.28% | 32.03% |
| Kaduna | 4.25% | 48.82% |
| Kano | 5.50% | 15.73% |
| Katsina | 3.25% | 10.44% |
| Kebbi | 8.66% | 35.59% |
| Kogi | 8.81% | 1.67% |
| Kwara | 2.02% | 10.69% |
| Lagos | 0.00% | 0.00% |
| Nasarawa | 12.76% | 20.73% |
| Niger | 6.90% | 26.24% |
| Ogun | 19.74% | 13.16% |
| Ondo | 11.21% | 1.40% |
| Osun | 12.35% | 7.83% |
| Oyo | 0.90% | 14.07% |
| Plateau | 3.12% | 15.97% |
| Rivers | 17.20% | 20.43% |
| Sokoto | 19.39% | 24.95% |

| Row Labels | Percentage of households with health shock experience in both waves of the survey | Percentage of households with agriculture shock experience in both waves of the survey |
|---|---|---|
| Taraba | 2.98% | 16.76% |
| Yobe | 2.89% | 32.72% |
| Zamfara | 1.32% | 19.77% |

**Table 2. Summary Statistics**

| Variable | Mean | Std. Dev. |
|---|---|---|
| Hours worked | 9 | 5.8 |
| Enrolled in School | 0.60 | 0.16 |
| Age mother | 48 | 34 |
| Age father | 50 | 22 |
| Education mother (1=yes, 0=no) | 0.51 | 0.58 |
| Education father (1=yes, 0=no) | 0.53 | 0.50 |
| household size | 8 | 3 |
| agricultural shock(1=yes, 0=no) | 0.33 | 0.23 |
| Age of child | 11 | 2 |
| Mother ill | 0.37 | 0.62 |
| Father ill | 0.30 | 0.60 |
| Other adult household member ill | 0.21 | 0.54 |
| Child ill | 0.32 | 0.47 |
| Male child=1 | 0.52 | 0.49 |

**Table 3. Impact of shocks on child labor and school enrollment (Full sample)**

| | (1) | (2) |
|---|---|---|
| **Dependent variable** | Agricultural work in hrs (Full sample) | School enrollment (Full sample) |
| Agricultural shock | 2.031** | -0.312** |
| | (0.04) | (0.040) |
| Father's illness | 1.103** | 0.012 |
| | (0.035) | (0.140) |
| Mother's illness | 0.923 | -0.023 |
| | (0.245) | (0.433) |
| Child's illness | -0.812** | -0.091** |
| | (0.060) | (0.050) |
| Illness of adult household member | 0.823 | 0.144 |
| | (0.134) | (0.137) |
| Number of observations | 15601 | 15601 |

** indicates significance at 10%

P-values in parenthesis

Regressions control for individual and household characteristics

**Table 4.  Impact of household shocks on school enrollment and child labor (Boys only and girls only sample)**

|  | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| **Dependent variable** | Agricultural work in hrs (Boys only) | School enrollment (Boys only) | Agricultural work in hrs (Girls only) | School enrollment (Girls only) |
| Agricultural shock | 2.010** | -0.266** | 1.119** | -0.230** |
|  | (0.01) | (0.03) | (0.041) | (0.061) |
| Father's illness | 1.123** | -0.065 | 1.003** | -0.121 |
|  | (0.01) | (0.216) | (0.05) | (0.323) |
| Mother's illness | 1.034 | -0.114 | -0.567 | -0.041 |
|  | (0.754) | (0.121) | (0.810) | (0.136) |
| Child's illness | -1.453** | -0.501** | -0.612 | 0.125 |
|  | (0.042) | (0.005) | (0.113) | (0.156) |
| Illness of adult household member | 0.913 | 0.002 | 0.223** | 0.285 |
|  | (0.154) | (0.467) | (0.090) | (0.765) |
| Number of observations | 8215 | 8215 | 7386 | 7386 |

** indicates significance at 10%

P-values in parenthesis

Regressions control for individual and household characteristics