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Child labor activities and schooling decisions in rural Côte d'Ivoire¹

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Abstract

We leverage data on 1,857 families in 140 rural cocoa-growing communities of Côte d'Ivoire to report on child work activities and schooling decisions. We distinguish between domestic, economic, and agricultural child labor activities reported by children in 2021 during the COVID-19 pandemic. We find that more than 80% of children participate in at least one domestic work activity and more than 50% at least one economic or agricultural work activity, with differences between boys and girls. Older boys performed more agricultural work activities, and girls performed more domestic work activities. Thirty-five percent of children were engaged in agricultural child labor, a rate similar to a national estimate of child labor in cocoa-growing communities of Côte d'Ivoire in 2018/19. Child labor and schooling are predicted by a child's age and gender, household factors such as parental age, family size, multidimensional poverty, and community factors, especially community-level child labor rates. Social protection and education programs targeting older boys could improve their schooling outcomes and reduce agricultural child labor. Likewise, addressing acute poverty with multifaceted programs reducing consumption-based poverty, poor parental education, and improving community infrastructures could reduce child labor.

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1. Introduction

Child labor affects 160 million children worldwide, with a staggering 87 million of these cases found in Sub-Saharan Africa (ILO and UNICEF 2021). In the absence of social protection responses, this number could have risen by 9 to 46 million by the end of 2022. The agricultural sector employs a majority of child laborers (70%), who often work in small-scale family farming plantations (ILO and UNICEF 2021). Cocoa production, which is predominantly carried out on family-owned land, significantly contributes to this issue. Ghana and Côte d'Ivoire are the foremost global exporters of cocoa (World Integrated Trade Solutions 2019).

Child labor has been linked to lower human capital outcomes, such as reduced school attendance, learning, and health (Boozer and Suri 2001; Gunnarsson, Orazem, and Sánchez 2006; Edmonds 2007; Beegle, Dehejia, and Gatti 2009). Schooling is particularly connected to child labor, as it represents an opportunity cost for parents who require their children's assistance in family activities. Reliable estimates of child labor and schooling during and after the pandemic in Côte d'Ivoire and other countries are scarce due to data limitations. A recent report using data from 2018/2019 revealed that 38% of agricultural households in cocoa-growing communities of Côte d'Ivoire engaged in child labor (Sadhu et al. 2020). Interestingly, the report estimated that 84% of working children aged 5-17 also attended school in the previous 12 months. The COVID-19 pandemic may have exacerbated the risks of child labor, whether combined with schooling or not. This paper aims to leverage data collected in 2021, during and after the COVID-19 pandemic in Côte d'Ivoire, to provide insights into child labor during this critical period and identify the predictors of agricultural child labor and schooling decisions.

Child-, Household-, and Community-level Predictors of Child Labor and Schooling

Basu and Tzannatos (2003) and Edmonds (2008) provided two comprehensive literature overviews on factors associated with child labor. A complex set of determinants can predict agricultural child labor and schooling decisions. Empirical studies primarily identified three groups of socio-economic and demographic predictors relating to the child, the household, and the community they reside in.

Child factors correlated with child labor and schooling mainly include the child's gender and age, and whether they live with their biological parents. Studies in Côte d'Ivoire, Ghana, and Vietnam have found that boys are more at risk of agricultural labor, while girls are more involved in domestic child labor. In Côte d'Ivoire, being male was positively and significantly related to the likelihood of combining child labor with schooling (Grootaert et al. 1998; Nkamleu and Kielland 2006). Similarly, older children and those not living with their biological parents were at higher risks of endorsing agricultural labor. In Ghana, boys had a higher chance of working on the farm, while girls endorsed household chores more (Canagarajah and Coulombe 1997). In Vietnam, girls were more likely than boys to work in different types of work (Edmonds 2005). One notable exception in this pattern of results is the work of Bhalotra and Heady (2003) on a sample of agricultural families in Ghana and Pakistan. They found that daughters of land-rich households were likelier to work on the farms than those of land-poor families. The effect was explained by land, credit,

labor market imperfections within countries, and the returns to boys' education. With these market imperfections and higher returns to boys' education, parents would prefer to employ their girls in lands and educate their boys.

Household factors describe the family in which the child lives, and the main determinants include household poverty, education, and family size. Poverty is a critical determinant and is often considered the *raison-d'être* for child labor. A "*poverty assumption*" was formulated in one of the seminal theoretical contributions (Basu and Van 1998). They proposed a conceptual framework built under the hypothesis that child and adult labor are substitutable inputs in the family production function. Under binding subsistence constraints, parents resort to child labor. Several empirical studies from various countries, including Ecuador, Côte d'Ivoire, Vietnam, and Tanzania, validated this assumption (Grootaert et al. 1998; Edmonds 2005; Nkamleu and Kielland 2006; Beegle, Dehejia, and Gatti 2006; Edmonds and Schady 2012; de Hoop and Rosati 2014; Abou 2014). In Ecuador, Edmonds and Schady (2012) found that improved economic status postponed entry into the labor force for children in school. In Côte d'Ivoire, Grootaert et al. (1998), Nkamleu and Kielland (2006), Nkamleu (2009), and Abou (2014)² found that children from more generous economic backgrounds worked less. In Vietnam, Edmonds (2005) found that 60% of the observed decrease in child labor over time can be explained by improved economic status. In Tanzania, Beegle et al. (2006) found that crop shocks increased poverty and child labor significantly. Some notable exceptions to the findings linking child labor and poverty are Bhalotra and Heady (2003), Bhalotra (2007), and Dumas (2007). Bhalotra and Heady (2003) found a wealth paradox in Ghana and Pakistan: richer households endorsed more child labor, a finding explained by market imperfections and returns to education, as discussed above. Dumas (2007) documented a similar wealth paradox in Burkina Faso and did not find evidence that poverty was the main cause of child labor. Lastly, in Pakistan, Bhalotra (2007) found evidence that poverty compelled child labor, but only for boys. Girls might work even in the absence of poverty because parents' perception of the return to girls' education was low.

Other household factors were also stressed in earlier work. In Vietnam, for instance, Edmonds (2005) found that higher household resources translated into child labor reductions for larger families. Similarly, in Côte d'Ivoire, Nkamleu and Kielland (2006) found that children in larger households were less likely to endorse child labor as the intrahousehold labor allocation favored the labor of adult siblings. They did not find any supporting evidence that parental age predicted child labor. Grootaert et al. (1998) and Nkamleu and Kielland (2006) also found that educated Côte d'Ivoire parents endorsed schooling as the only alternative or significantly preferred a combination of schooling and child labor over the option of neither schooling nor child labor.

The third group of factors analyzed in the literature is the role of **community factors**. In an older study

² Grootaert et al. (1998) used a multipurpose household survey with national coverage, a survey that recorded labor force participation for all household members aged 7 years and above. Nkamleu and Kielland (2006) and Nkamleu (2009) used cross-section data of a representative sample of over 11,000 members of cocoa households. Lastly, Abou (2014) used the 2005 data from national surveys on child labor.

in Côte d'Ivoire, Nkamleu and Kielland (2006) found that higher housing quality in the community (which proxies wealth) was associated with a lower likelihood of endorsing child labor as the only alternative or in combination with schooling. They also found that children living in the Western region of Côte d'Ivoire were less likely to endorse school as the only alternative, while those from the Center-West of the country were more likely to combine schooling and child labor. Their results highlight the importance of within-community norms and practices in predicting household decisions.

COVID-19 Pandemic and Child Labor

COVID-19 created a negative shock on both families' resources and schooling. On the one side, several families have experienced acute poverty without appropriate social protection mitigation measures (ILO and UNICEF 2021). A study on a panel of individuals documented significant employment, income, and consumption declines in urban Côte d'Ivoire between March and June 2020 (Dupas, Fafchamps, and Lestant 2022). The drop in income was high, 40-50% on average, irrespective of baseline education levels. Data collected in December 2020 suggest that recovery was slower among male casual workers. Likewise, government responses regarding social protection measures (food or cash transfers) and in-kind transfers such as face masks and antiseptic gel did not specifically target the poorest families.

On the other side, government measures to limit the spread of the virus led to school closures, with a solid body of evidence suggesting that it negatively affected education outcomes (Lancker and Parolin 2020; Azevedo et al. 2021; Angrist et al. 2021; Moscoviz and Evans 2022; Wolf et al. 2022). Globally, the pandemic forced 1.6 billion children to be temporally out of school, with 26% living on the African continent (United Nations Educational, Scientific and Cultural Organization (UNESCO 2020)). In Côte d'Ivoire, schools were closed from April to August 2020, affecting more than 6 million school-aged students, of which more than 4 million were primary-school children (World Bank 2022). As schools reopened in September 2020, there is suggestive evidence that the long duration of closures affected both learning outcomes and dropouts, with higher dropouts among girls (Moscoviz and Evans 2022). In Côte d'Ivoire, evidence from an urban sample of families found significantly lower enrollment rates in January 2021 among 14-16 years old children, with no evidence of a higher dropout for girls (Dupas, Fafchamps, and Lestant 2022).

As discussed above, drops in income, especially for poorer households, are conducive to child labor. Relatedly, school closures during COVID-19 increased dropouts which also could favor child labor. Likewise, long school closures could have also favored new task allocation within households, increasing the likelihood that children combine work and school. The International Cocoa Initiative surveyed cocoa farmers in Côte d'Ivoire and found increases during the pandemic (ICI 2020). Factors that predicted this increase are still unknown.

Current Study

We collected data from almost 2000 families (maternal caregiver and one focal child aged 5-15) in 140 villages of three major cocoa-growing regions of Côte d'Ivoire. Our data was collected in 2021, during

and in the aftermath of the COVID 19-pandemic lock downs imposed in many countries but with the pandemic still looming large. In this context of rural Cote d'Ivoire in 2021, we address three research questions:

1. What were the rates of child engagement in household work activities and child labor during and in the aftermath of the COVID-19 pandemic?
2. Do rates differ between boys and girls and younger and older children?
3. What child, household, and community factors predict agricultural child labor and schooling in?

We contribute to a growing literature documenting children's outcomes during and in the aftermath of the COVID-19 pandemic. Further, we contribute to the literature on child labor in at least three different ways. First, we provide recent estimates from a large sample families and communities in rural Côte d'Ivoire and discuss factors affecting child labor and schooling in an unprecedented pandemic context. As discussed above, the impact of the pandemic on income and dropouts were already high in urban areas, suggesting that they could have been worse in rural contexts of Côte d'Ivoire. While we cannot conclude whether any difference that we see is caused by the COVID-19 pandemic, our results offer a unique set of indicators and factors that are of direct relevance to policymakers in Côte d'Ivoire and beyond.

Second, we differentiate between child activities and child labor. Child labor is work that deprives children of their childhood, potential, and dignity and is detrimental to their physical and mental development (International Labor Organization, 2021). Researchers generally use a mix of ideology, national legal frameworks, and international standards to measure child labor. Some studies often include chores such as fetching water and cleaning the house in the previous week as child labor. This approach makes it harder to differentiate child labor from activities children engage in as they grow. In this study, we used a definition of child labor that falls under the "*common definition*," a legal framework to characterize child labor in cocoa-growing settings of Côte d'Ivoire and Ghana.

Third, child activities and child labor are reported by the child. Researchers usually have the choice between surveying an adult household member (also called the proxy respondent) or the child directly to measure engagement in child work activities and child labor. It is established that child labor measurement varies by respondent type, and less frequently, the measure comes from the child (Dammert and Galdo 2013). International recommendations also favor asking the child directly (ILO 2008), but it is not always logistically feasible. Asking proxy respondents can lead to biased reporting, especially for girls in agricultural settings (Galdo, Dammert, and Abebaw 2021). A recent study in Côte d'Ivoire found that parents might underreport child labor by 60% more, with children reporting more accurately (Lichand and Wolf 2022). By using child responses, our study accounts for the research limitations associated with proxy respondents.

2. **Data, measures, and analytic plan.**

a. **Data**

Data come from the baseline survey of a randomized controlled trial (RCT) examining the impact of poverty alleviation and education quality interventions on child labor and learning outcomes in rural Côte d'Ivoire (Jasinska et al. 2021). We sampled 140 communities in three regions of the country: Haut-Sassandra and Marahoue (Sassandra-Marahoue district) and Nawa region (Bas-Sassandra district). These three regions represent 3.9 million people in 2021 and 13.2% of the country's total population (INS 2021). The districts to which they are attached represent 15.4% of the country's total area.

We first sampled communities and then households within communities. First, communities were sampled from cocoa-growing cooperatives spanning the areas of Bouafle (Marahoue region), Daloa (Haut-Sassandra region), and Meagui (Nawa region). To be eligible for the study, the cooperative had to be officially registered, located in a remote community, and willing to participate. Second, 15 families in each community were selected to participate in the study. These families were chosen by community leaders (cooperative heads, village chiefs, and other local leaders) based on whether the household was considered poor and had a child aged 5-15 years old living with them. All of these selection conditions were defined by the research team and the implementing partners for the RCT.

All data were collected in participants' homes with the main female caregiver and one random focal child aged 5-15. Surveys were administered by experienced and trained enumerators and included direct child and parent assessments. Interviews were conducted in French, and participants could be interviewed in their local language if they could not speak French. We collected oral consent to participate in the study from all participants, as is common practice in rural communities of Côte d'Ivoire. All the families selected to benefit from the interventions were involved in the study, and there were no exclusion criteria. Lastly, participants were sampled in two consecutive cohorts, depending on when their communities started benefiting from the interventions. The study received ethics approval from the University of Toronto (protocol number 39924), and we also received authorizations to visit communities from the Ministry of National Education and Literacy of Côte d'Ivoire.

b. **Measures**

Outcome variables: Child activities, school enrollment, and child labor.

Each child reported whether they had engaged for at least an hour in 51 activities over the previous 12 months, including domestic, economic, and agricultural activities. Domestic work ($n = 10$) covered most of the activities performed inside the family, such as buying goods for the family, supporting house cleaning, and washing clothes. Economic activities ($n = 5$) covered work for pay, unpaid work in family activities, and other lucrative economic activities such as hunting wild animals and catching fish for sale. Agricultural or farm activities ($n = 36$) covered critical activities of cocoa cultivation, from planting to harvesting. We used recently validated items in Côte d'Ivoire to measure the incidence of agricultural child labor (Sadhu et al. 2020). They covered activities such as collecting and pilling pods, breaking cocoa pods

for fermentation, drying cocoa, and wedding.

Schooling was measured by looking at school enrollment in the past academic year, as reported by the focal child. Child labor is defined using the "*common framework*," a "*common-ground*" definition of child labor between the Ghanaian and the Ivorian legal frameworks within a broader ILO framework (Sadhu et al. 2020). In this framework, a child aged 5-17 is a laborer in the cocoa agricultural sector if she exceeds their age group's maximum allowable working hours and/or is exposed to hazardous activities (Sadhu et al. 2020). Our data do not have information on how long children spent on each activity in the past week, so we focus on the subcategory of hazardous work to keep a definition of child labor consistent with the Côte d'Ivoire's legal framework. There are 6 categories of hazardous activities: (i) conducting land clearing; (ii) carrying heavy loads; (iii) using agrochemicals; (iv) using sharp tools, (v) engaging in long hours or (vi) engaging in night work (Sadhu et al. 2020). A child performing at least of one activity in those categories would be considered as a child laborer.

Predictors and Covariates

We collected child and household-level indicators from the focal child and the main female caregiver. Child demographics were reported by the child. Mothers reported, among others, on households' primary source of income, their education, the education of their spouse, their assets, the size of their family, their relationship to the focal child, and whether they were heads of their families. We measured household poverty using a Multidimensional Poverty Index (MPI) and the Poverty Probability Index (PPI). The MPI (also known as the Alkire-Foster index) assesses how individuals experience poverty. It quantifies the level of deprivation that households face across various dimensions using a composite indicator of equally-weighted dimensions of deprivation (Alkire and Santos 2014). We averaged indicators in three domains: health, education, and living standards, following the methodology of Alkire and Santos (2014).³ The PPI is a poverty scorecard indicator aggregating data on ten nationally-relevant questions to assess a household's likelihood of being below a given poverty threshold (Desiere, Vellema, and D'Haese 2015). We used the PPI questions for Côte d'Ivoire and followed the recommended methodology to derive the scores.⁴

We create three community-level variables by aggregating household scores on the PPI, the MPI, and child labor. Our regression framework adds these variables as covariates (for research question 3). For that question, we also included the proportion of data in each of the three main areas where the study was conducted, Daloa, Meagui, and Bouafle, and the cohort of the participants as covariates.

³ (1) Health: lack of food, poor assessment of one's health and experience of child mortality. (2) Education: at least one child not attending school in the household, not educated mother. (3) Living standards: no access to electricity, water, poor sanitation, low quality flooring, rustic cooking fuel and limited access to assets such as television, iron and radio.

⁴ The validated Côte d'Ivoire instrument includes 10 indicators. It covers the region in which the household lives, the number of household members, the education level of the household head, whether all school aged children go to school, access to water, type of toilet and bathroom facilities and a range of asset possession (bed, fan and car).

c. Analytic Plan

For research questions 1 and 2, our results are derived from descriptive statistics. For research question 1, we provided detailed aggregate data on the 51 activities children could endorse and aggregated scores on the average number of activities by each category (economic, domestic, farm). For the second research question, we provided aggregate descriptive data on child activities by the age and gender of the child. We also provided Empirical Cumulative Density Functions (ECDF) on these two demographic variables. ECDF counts the number of observations below a certain point and elegantly depicts relationships between cumulative distributions. The curve below is where the population is more abundant for the same number of activities. For research question 3 on the determinants of child labor and schooling decisions, we implemented a multinomial logistic regression model. This approach is what has been used in earlier work in Côte d'Ivoire (Grootaert et al. 1998; Nkamleu and Kielland 2006). Child labor and schooling decisions are considered simultaneous and jointly-determined decisions. The family decides between four options, from the best to the worse option, from the perspective of a benevolent family:

- *School only*: The child does not engage in farm activities and only attends school.
- *Work and school*: the child attends school and simultaneously supports farm activities.
- *Work only*: the child does not attend school and only supports the family on the farm.
- *No work and no school*: the child neither works nor go to school.

These 4 states are mutually exclusive and exhaustive. We estimate the probability that a family decides on either of the options as a function of a matrix of Z characteristics. The likelihood that the family chooses option 1, for instance, is written as follows:

$$Prob(Y = 1) = \frac{1}{1 + \sum_{j=2}^S e^{\beta_j Z}}$$

β_j is our parameter of interest. Z comprises the characteristics of the child, the household, and the community. We accounted for child age and gender as the two characteristics of the child. The household characteristics included parental age, family size, parental education, and the household's poverty scores. Lastly, the characteristics of the community accounted for the aggregated poverty and child labor scores. We used *school only* as our reference category, and the model was estimated using the software R, version 4.0.4.

We tested the performance of the multinomial logit model by assessing its accuracy in classifying children into the appropriate category. We used our main results presented below and computed the likelihood of being in either of the categories (using our entire data set and average values). We displayed our actual rate against the predicted rate as a robustness check on the model's performance.

3. Results

- a. **Research Question 1**: How much did children engage in household activities and child labor during and in the aftermath of the COVID-19 pandemic?

We first describe engagement in family work activities. Data were reported by a focal child aged 5-15

($M_{age} = 9.2, SD = 2.5$), and we report an extensive range of domestic, economic, and farm activities. We used existing typologies to differentiate hazardous farm activities from other farm activities (Sadhu et al. 2020). Our main findings are summarized in Tables 1 (aggregate activities) and 2 (individual activities that we summarized in Panels A to D).

First, children in our sample perform 3.9 domestic activities on average. Domestic activities such as buying goods for the family, washing clothes, and cleaning the house are the ones that children perform the most, with an incidence above 50% (Panel A, Table 2). Conversely, children are less likely to repair household equipment, do construction, or do major repair work for their family's house or business.

<i>Variable</i>	<i>N</i>	<i>Mean</i>	<i>Std. Dev</i>	<i>Median</i>	<i>Max</i>
Domestic activities (sum of 10 activities)	1766	3.9	2.5	4	10
Economic child labor (sum of 5 activities)	1766	0.7	1.1	0	5
Farm (child) labor (sum of 36 activities)	1766	4.4	4.8	0	33
Hazardous farm labor (sum of 12 activities)	1766	1.0	1.8	0	11

Table 1: Child activities: indicators summary

Second, children performed less than one economic activity on an average of 5 (Table 1). Taken individually (Table 2 Panel B), the prevalence is always below 30%. 5.9% of children were domestic workers outside their household, either wage workers or in-kind compensated workers.

Lastly, regarding agricultural work, children perform an average of 4.4 and 1.0 hazardous activities. From Table 2, Panel C, major non-hazardous farm activities highly endorsed were: The collection and pilling of pods (46.3%), breaking of cocoa pods for fermentation (25.7%), drying of cocoa (27.3%), and weeding (28.5%). Likewise, there are two hazardous activities that children performed the most (Panel D, Table 2): weeding or pruning with machetes or knives (21.6%) and breaking cocoa pods with knives (29.0%). Activities such as working at night, spraying insecticides, spreading fungicides or other chemicals, and working with motorized farm machinery were rarely endorsed (incidence below 3%).

	<i>N</i>	<i>%</i>		<i>N</i>	<i>%</i>
Panel A: Domestic activities					
1. Collect water or wood for household use	1766	54.3	6. Buy goods for the family	1766	71.6
2. Repair household equipment	1766	7.8	7. Wash clothes	1766	66.7
3. Do other types of the housework	1766	28.8	8. Prepare food	1766	34.0
4. Clean appliances/house	1766	58.7	9. Produce any other goods for the use of this household	1766	17.4
5. Do any construction or major repair work on one's own or family's house, plot, or business	1766	6.5	10. Attend children, the elderly, or the sick: alone or with another person	1766	40.4
Panel B: Economic child labor					
1. Do unpaid help of any kind for the family business	1766	25.5	4. Catch fish, shrimp, shellfish, hunt wild animals,	1766	18.9

2. Do any work for pay, salary, commission, or payment in kind (except domestic work)	1766	15.5	and others for sale or household consumption	1766	18.8
3. Do any work as a domestic worker for wages, salary, or payment in kind	1766	5.9	5. Manage or do any business, big or small, for yourself or with one or more partners (friends or brothers)	1766	18.8
Panel C: Farm activities					
1. Clean up the fields	1766	31.1	13. Maintain and prune cocoa trees	1766	7.3
2. Felling and cutting down trees	1766	7.8	14. Controlling parasitic plants	1766	7.3
3. Burn down trees	1766	8.0	15. Picking pods	1766	20.4
4. Dig up tree roots	1766	7.3	16. Collecting and piling pods	1766	46.3
5. Prune stems	1766	8.6	17. Breaking cocoa pods and letting them ferment	1766	25.7
6. Align and plant stakes	1766	6.9	18. Transporting fermented cocoa beans	1766	19.9
7. Dig up/put in cuttings	1766	10.7	19. Drying cocoa beans	1766	27.3
8. Prepare seedbeds	1766	11.0	20. Transporting dried beans to the storage place	1766	16.2
9. Dig/plant seedlings in the ground	1766	11.2	21. Hunting with a weapon	1766	2.5
10. Sow with stakes	1766	7.9	22. Burning wood for charcoal production	1766	2.5
11. Weeding	1766	28.5	23. Working as a lumberjack or logger	1766	1.2
12. Carrying water for watering	1766	19.1	24. Do any kind of work in the fields, plot, or garden belonging to the family	1766	46.2
Panel D: Farm child labor					
1. Using machetes/long knives for weeding or pruning	1766	21.6	7. Harvesting cocoa pods with a hook	1766	14.0
2. Spraying insecticides	1766	2.9	8. Breaking cocoa pods with knives	1766	29.0
3. Spreading fungicides, herbicides, and other chemicals	1766	2.7	9. Spreading fertilizers	1766	6.6
4. Work at night (between 6:00 p.m. and 6:00 a.m.)	1766	0.6	10. Working alone on the farm in isolation (i.e., out of visible or audible range of the nearest adult)	1766	6.2
5. Working without adequate basic protective clothing for feet and body	1766	6.9	11. Working with motorized farm machinery (e.g., mowers, backpack sprayers, etc.)	1766	2.9
6. Being present or working near the farm when spraying agrochemicals or returning to a sprayed farm within 12 hours	1766	6.6	12. Climbing trees over 2.5 meters high to cut pests or harvesting or pruning pests with knives or sharp tools	1766	4.9

Table 2: Percent participation rates in domestic, economic, and agricultural work activities.

Note: This table summarizes child participation in household activities. Children provided answers on each of these items. The table summarizes the number of activities and the proportions of those who replied Yes. Don't know was recoded as Nos.

b. Research Question 2: How does that involvement differ between boys and girls and younger and older children?

We assessed how children engaged in household activities depending on their demographics. Our descriptive results are summarized in Table 3 and Figures 1 and 2. First, boys worked less than girls to work, considering all activities, with 87% performing at least one activity, vs. 91% for girls (Panel A, Table 3). However, there were notable differences, with boys reporting more farm activities (almost twice as

much as girls) and less domestic work (one activity less on average). In Figure 1, the ECDF of girls in domestic work is always below that of boys, while the ECDF of boys in farm work is always below that of girls. The difference between boys and girls on farm child labor remained for hazardous agricultural activities.

Second, on the difference between age cohorts, younger children worked less. In Figure 2, we divided our sample into two groups, those aged 6 and below and those above 6, with 6 being the minimum schooling age in Côte d'Ivoire. Younger children worked less than their older peers in any of the categories. Panel B of Table 3 provides detailed indicators between groups by looking at 11 different age categories. At age 5, almost 60% of children reported doing domestic work, 1.4 activities on average. There is nearly a monotonic increase with child age (at a decreasing rate) in the percent involved in household activities and the number of activities they carry. A significant change happens between 5 and 6 as the number of activities jumps by 400% for economic work and 116% for farm work.

	N	Percentage doing at least one activity					Number of activities			
		Any activity	Domestic	Economic	Farm	Hazardous	Domestic	Economic	Farm	Hazardous
Panel A: Child gender										
Female	866	90.8	89.8	39.2	45.2	26.9	4.39	0.70	3.19	0.58
Male	900	86.9	85.2	39.3	54.7	45.2	3.35	0.74	6.25	1.50
Panel B: Child age										
5	86	60.5	59.3	5.8	15.1	9.3	1.44	0.07	0.90	0.15
6	161	77.0	76.4	18.0	26.1	14.3	2.47	0.38	1.94	0.39
7	243	83.9	81.9	26.7	44.9	28.4	3.07	0.42	3.33	0.72
8	274	91.2	88.7	31.7	47.4	32.1	3.57	0.51	3.86	0.79
9	205	94.2	92.2	45.8	59.0	44.4	4.20	0.80	5.56	1.19
10	289	93.1	92.0	44.3	60.9	41.9	4.28	0.78	5.85	1.28
11	121	98.4	97.5	48.8	51.2	34.7	4.63	0.91	4.67	0.88
12	117	97.4	97.4	59.0	61.5	53.0	5.09	1.19	7.06	1.59
13	83	97.6	97.6	66.3	68.7	60.2	5.52	1.30	8.19	1.87
14	60	95.0	95.0	65.0	70.0	61.7	5.08	1.32	8.47	2.23
15	162	98.4	98.4	77.4	61.3	54.8	6.05	1.82	9.35	2.37

Table 3: Variations of child labor indicators across demographic indicators of the child

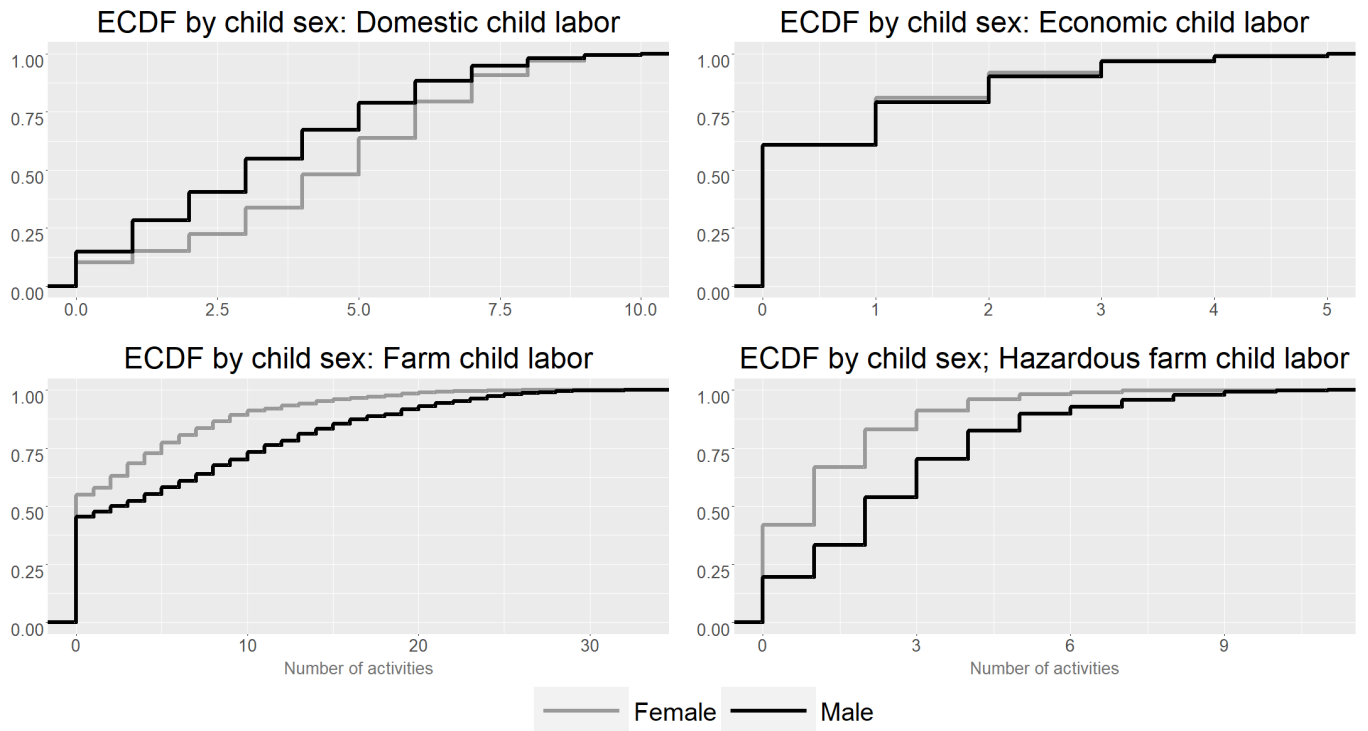


Figure 1: ECDF Child labor by gender

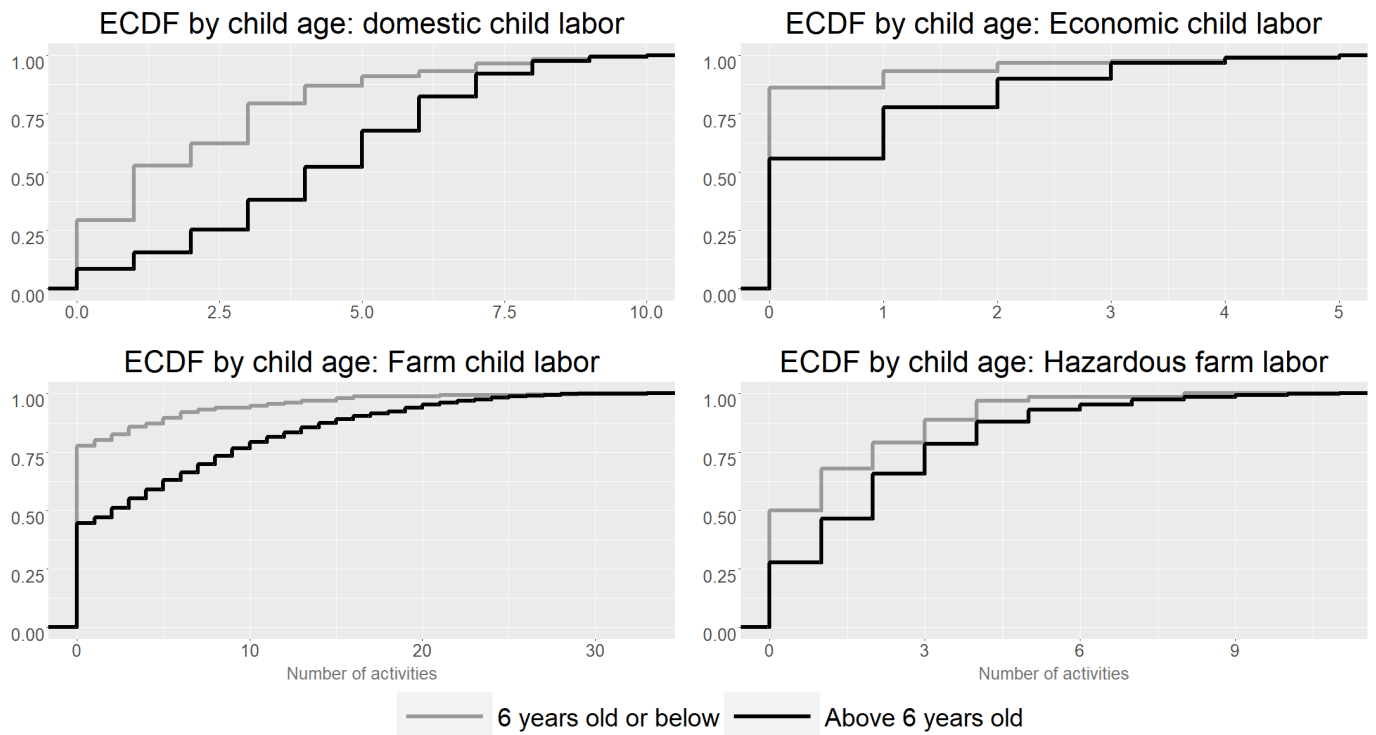


Figure 2: ECDF Child labor by age groups

c. **Research Question 3:** What factors predict agricultural child labor and schooling in rural Côte d'Ivoire in 2021?

i. Descriptive statistics on the sample.

We describe the sample in Table 4 and divide indicators into three panels, A to C. Panel A displays child characteristics. The average child is 9.2 years old (SD = 2.5), and 84.2% are enrolled in school. The sample is equally split among boys and girls. We provide descriptive statistics on our dependent variable under Panel A in Table 4. Most children were in school only (55.4%), and another 34.9 combined schooling with child labor. 3.3% worked only, and 5.6% were neither in school nor working. Work and school, and school only, were the two most abundant categories.

Panel B provides descriptive data on households. Female caregivers were, on average, 41.1 years old (SD = 10.7) and lived in households with an average of 6.5 people. Only 16% of women were heads of their families, and 73.1% lived with their biological children. Maternal education was low, with only 31.0% of educated mothers.⁵ Paternal education was relatively higher, with 51.1% of fathers having completed primary school education or more. The average age dependency ratio (proportion of dependents aged below 6 and above 65 to non-dependent household members) was relatively low, at 0.2. Poverty indicators are the last two rows under Panel B. For the MPI, the average score for our sample was 0.5, which indicated a severely multidimensionally poor sample (Alkire and Santos 2014). The PPI score was 58.2%, equivalent to almost 6 out of 10 families likely living below the poverty line. This estimate implies that our sample is poorer than the average household in Côte d'Ivoire, where the PPI estimate is at 45.8%. Panel C displays community-level variables and other covariates. We aggregated PPI and MPI data at the community level to create community-level indicators. The scores remain comparable to individual-level data: 0.5 for the MPI and 57.2% for the PPI. Most participants in the study came from the Daloa region (42.1%), followed by Bouafle and Meagui (34.9 and 23.0%, respectively). 55.9% of participants were registered in cohort 1, and the remaining 44.1% were in cohort 2.

<i>Variable description</i>	<i>N</i>	<i>Mean (%)</i>	<i>St. dev</i>	<i>Min</i>	<i>Median</i>	<i>Max</i>
Panel A: Child characteristics						
Child age	1701	9.2	2.5	5	9.0	15.0
Sex (% males)	1766	51.0				
Enrolled in school (proportion)	1766	84.2				
Child labor & schooling decisions						
School only	1615	55.4				
Work and school	1615	34.9				
Work only	1615	3.3				
No work and no school	1615	6.4				

Panel B: Households' characteristics

⁵ A parent was educated if s/he had attended at least one grade of formal education.

Age of the mother	1715	41.1	10.7	18	40.0	82.0
Size of the household	1766	6.5	2.9	1	6.0	15.0
Dependency ratio (%)	1766	0.2				
Biological parents (%)	1766	73.1				
Father's education (%)	1551	51.1				
Mother's education (%)	1766	31.0				
Women as household heads (%)	1766	16.1				
Reliance on cocoa agriculture (%)	1766	77.9				
MPI score	1766	0.5		0.1	0.4	1.0
PPI – national poverty line (%)	1764	58.2		5.8	60.8	93.2
Panel C: Community-level variables and covariates						
MPI score at the village level	140	0.50		0.3	0.5	0.7
PPI index at the village level	140	57.2		36.2	58.3	82.2
Bouafle region (%)	1766	34.9				
Daloa region (%)	1766	42.1				
Meagui region (%)	1766	23.0				
Cohort 1 (%)	1766	55.9				
Cohort 2 (%)	1766	44.1				

Table 4: Sample descriptive characteristics.

Note: As is standard, standard deviations are not computed for proportions. For poverty scores, we reported other descriptive indicators. The score at the village level is an average of scores within villages.

ii. Multivariate Models

We estimated a multinomial logit model to compute the odds of being in either of the categories. We considered child-, household-, and community indicators. The reference category is the "school only" category. We group our main econometric results in panels A to C in Table 5.

First, on child-level predictors (Panel A), boys were more likely than girls to *work only* or to combine *work with schooling*. On average, a boy was at least 2 times more likely to work and school or to work only. Likewise, a one standard deviation increase in age was associated with a higher likelihood of being in the no-work and no-school category.

Second, on household factors (Panel B), findings were more nuanced. For instance, one standard deviation increase in parental age was associated with a higher likelihood of being in the *work-only* category, and children in larger families were likelier to combine work and school. However, the father's education, income periodicity, and whether the family was polygamous did not correlate with the households' decisions. Finally, the MPI was associated with a higher likelihood of the decision to *work only*. In particular, a one standard deviation increase in MPI increased by 2.5 on average, the odds of working only. Likewise, when MPI increased by one standard deviation, the likelihood of neither being in school nor working rose by 60%. The PPI score (converted to a percentage) was not associated with households' decisions.

Third, on community factors (Panel C), we found that MPI did not correlate with families' decisions. PPI was associated (10% significance threshold) with more decisions of no work and no school. Interestingly, child labor in the community correlated with families' decisions to engage in child labor activities. In particular, if child labor increased by one standard deviation in the community, the family was 2.7 times more likely to engage the child in work only and 2.3 times more likely to engage the child in work only.

	<i>Dependent variable:</i>		
	2. Work and school	3. Work only	4. No work and no school
Panel A: Characteristics of the child			
Male	2.670*** (0.137)	3.020*** (0.332)	0.747 (0.252)
Age	2.694* (0.553)	0.247 (1.209)	0.004*** (0.864)
Age * Age	0.630 (0.551)	9.236* (1.137)	238.885*** (0.866)
Panel B: Characteristics of the household			
Parent age	0.887 (0.083)	0.544*** (0.199)	0.871 (0.148)
Dependency ratio	1.032 (0.073)	0.690* (0.198)	0.963 (0.121)
Biological parents (=Yes)	1.131 (0.178)	0.646 (0.392)	0.871 (0.312)
MPI score	0.967 (0.093)	2.460*** (0.224)	1.603*** (0.175)
PPI score	0.943 (0.093)	0.867 (0.231)	0.773 (0.163)
Household size	1.188** (0.073)	1.281 (0.166)	0.885 (0.148)
Polygamous family (= Yes)	0.952 (0.155)	0.790 (0.361)	1.558 (0.273)
Income periodicity (= by harvest)	0.996 (0.146)	0.706 (0.332)	0.753 (0.257)
Income level	1.097 (0.070)	1.115 (0.171)	0.966 (0.130)
Father's education status (= Educated)	1.028 (0.170)	1.484 (0.418)	1.454 (0.321)
Mother's education status (= Educated)	1.043 (0.142)	0.384*** (0.365)	0.606* (0.265)
Panel C: Characteristics of the community			
Farm child labor in the cluster	2.718*** (0.081)	2.332*** (0.177)	0.974 (0.153)
MPI in the cluster	1.107 (0.098)	0.983 (0.240)	1.014 (0.185)
PPI in the cluster	1.111 (0.126)	1.150 (0.313)	1.512* (0.232)
Panel D: Covariates			
Bouafle	0.891 (0.204)	0.273*** (0.494)	0.336*** (0.340)
Daloa	0.864 (0.159)	0.935 (0.373)	1.022 (0.267)
Meagui	0.660** (0.162)	0.710 (0.352)	0.870 (0.287)
Cohort 1	0.765** (0.133)	0.354*** (0.280)	0.309*** (0.237)

Cohort 2	0.664*** (0.142)	0.512** (0.282)	0.966 (0.235)
Constant	0.508*** (0.122)	0.181*** (0.278)	0.299*** (0.215)
Akaike Inf. Crit.	2,294.382	2,294.382	2,294.382

Note: *p<0.1; **p<0.05; ***p<0.01

Table 5: Risk factors of (hazardous) child labor and schooling decisions in Côte d'Ivoire.

iii. Testing the Performance of the Predictive Model

Our independent variables capture more variability for the *school-only* category than the three others. However, considering any misclassification in the *school and work* category as minor, our model can predict at least 99% of *schooling* and *school and work* combinations.

Higher misclassifications appear on the *work-only* decision, with the model performing less in identifying children who work only. Only 3.3% of children were originally in this category. Our model fails in classifying them; instead, it classifies several children in the work and school or school-only categories. Lastly, on the *no-work and no-school* decisions, the model could accurately classify 22% of children on average. Regardless of these two minor misclassifications, our model acceptably predicted the difference between children schooling only and those combining work and school.

		Actual rates			
		School only	Work and school	Work only	No work and no school
Predicted	School only	632 (82%)	208 (42%)	25 (50%)	90 (70%)
	Work and school	131 (17%)	275 (56%)	24 (48%)	11 (9%)
	Work only	1 (0%)	6 (1%)	0 (0%)	0 (0%)
	No work and no school	8 (1%)	1 (0%)	1 (2%)	28 (22%)
Total (n)		772 (100%)	490 (100%)	50 (100%)	129 (100%)

Table 6: Multinomial logit model performance.

Actual rates indicate survey data, while predicted indicate what we got from the model.

4. Discussion and Conclusions

This paper has documented the incidence of children's domestic, economic, and farming activities and the determinants of schooling and child labor in rural Côte d'Ivoire in 2021, an unprecedented time for children's work and schooling in light of the pandemic. We found that children engaged in an average of 3.9 domestic activities (on a total of 10), 0.7 economic activities (on a total of 5), 4.4 farm activities (on a total of 36), and 1.0 hazardous farm activities (on a total of 12). We also found that girls endorsed more domestic work and boys endorsed farm labor, including hazardous farm labor. The number of activities

also monotonically increased with the child's age, with a jump between 5 and 6 years old. Lastly, we documented the characteristics of children, households, and communities correlated with child labor and schooling. We found that the age and gender of the child, parental age, MPI score, family size, and the level of farm child labor in the community were all predicting factors of child labor and schooling decisions.

The incidence of activities in these three categories brings a unique perspective to document the extent of children's activities in this context. Activities performed at homes, such as collecting water or wood, cleaning appliances, and washing clothes, can be considered integral parts of family life in rural Cote d'Ivoire. It is with no surprise that they are reported by more than one child in two, as these are everyday activities that children in the region perform as they grow up. Other activities, such as repairing equipment and doing construction, are less prevalent, with less than 10% of children reporting them. These last two are usually performed by experienced adult laborers, which can explain why their incidence was low. The incidence of economic activities is always lower than 30%. Activities such as doing unpaid help for the family business (25%), managing the business of the family (19%), or performing fishing or hunting for sale or household consumption (19%) are the ones with the highest incidence. Economic activities are usually performed outside the family to support the family's income. The low incidence reflects the structure of our sample: 78% of families in our sample have cocoa as their primary income source. Of the remaining 22%, only 3% receive their primary source of income from their business, 17% are farmers of other crops, and 2% receive their primary income from other activities.

We note some heterogeneity in how many farm activities children perform. Almost 30% of children endorse cleaning the fields, weeding, and drying cocoa beans. However, less than 10% maintain and prune cocoa trees or dig up tree roots. These activities are standard among cocoa farmers in Côte d'Ivoire (Grootaert et al. 1998; Nkamleu and Kielland 2006; Nkamleu 2009; Abou 2014; Sadhu et al. 2020). Agricultural activities can be grouped into several subsequent categories from land preparation (e.g., cleaning up the fields and felling and cutting down trees), planting (e.g., sowing and preparing seedbeds), farm maintenance activities (e.g., weeding and maintaining and pruning cocoa trees), to harvest (e.g., picking pods and collecting and piling pods) and post-harvest activities (e.g., drying cocoa beans and transporting dried beans to the storage place). Our data suggest that children are less involved during planting and relatively more during the other major phases of cocoa cultivation. The pattern is similar to what was found recently by Sadhu et al. (2020) in Côte d'Ivoire. Farmers usually only replace missing seedlings and take care of existing cocoa trees, which could explain why children are more involved in other activities than planting.

We examined child labor in cocoa communities by focusing on hazardous activities. The distinction between hazardous and non-hazardous activities is important as it allows for a characterization that matches the country's legal framework and facilitates national and international comparisons. Hazardous farm activities are those that pose major risks to children's development. For instance, using sharp tools is considered hazardous because children might lack the strength necessary to manipulate such tools. Likewise, spraying agricultural chemicals and spreading fertilizers might be a health hazard for children.

We reported that children endorsed hazardous activities such as using machetes or long knives for weeding, pruning, or breaking cocoa pods and using a hook to harvest cocoa pods. Other hazardous activities, such as working with motorized farm machinery, working at night, and spraying agricultural chemicals, were less endorsed. Our results compare to Sadhu et al. (2020)'s recent results. For instance, they estimated that 31% of cocoa-growing households in 2018/2019 in Côte d'Ivoire used sharp tools in cocoa farming. We found that 29% of children break cocoa pods with knives, and 22% use machetes or long knives for weeding or pruning. Likewise, they also estimated that 2% of children reported night work, while this estimate is at 1% in our sample. These last two activities are the ones that children perform the most and the least.

Considering the difference between boys and girls, we found that boys endorse farm work (including hazardous work), while girls endorse more domestic activities. The econometric analyses suggested that boys were more likely than girls to combine work and school or to be only working. This difference can reflect gender norms on households' roles in the area and corroborates earlier work in Ghana (Canagarajah and Coulombe (1997) and Côte d'Ivoire (Nkamleu and Kielland (2006) and Nkamleu (2009)). The differential rate of child activities by age indicated a higher burden with the child's age, a pattern confirmed in the econometric analyses, as older children were more likely to combine work and school or to be neither at work nor school. Older children can better substitute for adult labor as they might already possess the strength and focus needed to perform agricultural activities.

Our econometric analyses indicated that child labor and schooling decisions were positively correlated with several parental factors. Analyzing these two decisions together helps account for the fact that they are determined by the same factors. Parents would choose one of four possible decisions: school only, work and school, work only, and no work and no school. Three interesting observations are of note. First, we found that children from older parents were more likely to work only. This result can reflect that older parents are more likely to demand external labor to substitute for their own labor. A result corroborating this finding is that the higher the dependency ratio, the higher the likelihood that children work only. Second, children from larger families are more likely to combine work and school, a finding similar to earlier work (Grootaert et al. 1998; Nkamleu and Kielland 2006). Last observation, MPI positively correlates with the decisions to work only, and to neither work, nor school. In particular, when families are in acute poverty or deprived on several dimensions, their likelihood of not having school as the child's only activity is high. This result adds to the well-established evidence that poverty status correlates with child labor (Basu and Van 1998; Grootaert et al. 1998; Nkamleu and Kielland 2006; Dumas 2007; de Hoop and Rosati 2014). However, our findings highlight that acute poverty matters more than consumption-based poverty.

Looking at community factors, we found that child labor rates in the village positively predicted decisions to work only and to combine work and school. This can reflect a peer influence inside the community. A similar result was found by Nkamleu and Kielland (2006) with another proxy of cluster variables (cocoa farmland, productivity, and non-cocoa farmland), all positively correlated with these decisions.

Our study has limitations that should be considered when interpreting the results. First, our analyses are cross-sectional and correlational. Thus, the coefficients should be interpreted as representing potential precipitating factors to child labor and their relative magnitudes, but no causal claims can be made. Likewise, we do not have pre-pandemic data to be able to rigorously assess the impact of the COVID-19 pandemic on child activities, child labor, and schooling. In a parallel study, we measure the impact of child labor alleviation policies using an RCT design (Jasinska et al. 2021). Second, we did not measure the intensity of engaging in any activities and could not analyze child labor in economic and domestic work. The number of hours spent on an activity matters to characterize it as child labor. We could not, therefore, characterize any of the domestic or economic activities as child labor but could do so for hazardous labor. Future work could consider collecting extensive data on how long children engage in activities to characterize whether they were child laborers in their domestic and economic activities. Lastly, when we tested the performance of our regression model that studied the determinants of child labor and schooling, we found that it better predicted the combination of work and schooling decisions and performed less well in predicting *work only* and *neither work nor school* decisions. Power is limited in binary comparisons, given the small sample size of children in these categories. This suggests that alternative approaches may be needed to assess which children are at risk of belonging to either of these groups. Future studies could improve the ability to classify children in this category by looking at other external factors explaining why children work only. Some of those may include school quality, land size, whether the household grows other crops, adult labor market failures, and access to credit (Canagarajah and Coulombe 1997; Bhalotra and Heady 2003; Guarcello, Mealli, and Rosati 2010).

Nonetheless, our paper offers three useful sets of results on future directions in research and policy efforts. First, our results call for targeted policy responses to reduce the burden of activities on all children, especially those facing disproportionate risks, such as girls and older boys. Our result that 35% of children engage in child labor is similar to what was found in 2018/19. Without pre-pandemic data in this community, one cannot conclude whether COVID-19 impacted this pattern. However, the persistently high rate call for immediate attention by policymakers and other development partners. Second, our results on acute poverty and how it correlates with the decision to work instead of schooling reinforce the importance of poverty reduction interventions to combat child labor (de Hoop and Rosati 2014). Beyond reducing poverty, our results suggest multifaceted interventions addressing financial constraints, parental education quality, and infrastructure access. Lastly, community factors influencing child labor and schooling decisions suggest that addressing community norms could be another lever to alleviate child labor.

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