

# Modeling farmers' decisions on child labor and schooling in the cocoa sector: a multinomial logit analysis in Côte d'Ivoire

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## Abstract

Since 2000, children working in the cocoa sector of Côte d'Ivoire have found themselves in the media spotlight. This situation has assumed particular importance because approximately 40% of the world's cocoa production occurs in Côte d'Ivoire. Concerned parties have since taken great interest in this thorny issue. There is a need to better understand the reality of child labor utilization in this sector. This article investigates child labor issues in the cocoa sector of Côte d'Ivoire in conjunction with schooling status of children. The study is based on a survey done in 2002, over a representative sample of more than 11,000 members of cocoa households. The multinomial logit model is used to capture choice probabilities across work and/or school options. The results reveal that child labor in cocoa farms and nonenrollment in schools are significant. Moreover, many children are involved in potentially dangerous and/or harmful tasks. Data also highlight gender and age dimensions in the participation of children in tasks and the way labor is allocated. Econometric results generally indicate that the gender and age of children, whether or not the child is the biological child of the household head, parents' education, the origin of the farmer, household welfare, household size, the household dependency ratio, the size of other perennial crop farms, the number of sharecroppers working with the household head, and communities' characteristics are all pertinent in explaining the child work/schooling outcome in the cocoa sector of Côte d'Ivoire.

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## 1. Introduction

The International Labor Organization (ILO) has been concerned about the role of children in commercial agriculture for a long time and has developed a number of conventions to set standards for their employment. However, there is still growing concern over the fact that some agricultural goods in developed country markets are being produced under certain forms of "hazardous work" practices. In particular, for many years, it has been persistently reported that children are being used for cocoa production in Côte d'Ivoire.

The cocoa sector in Côte d'Ivoire is of particular interest to the country and to the global chocolate industry. During the last three decades, the sector has tripled in size and now accounts for over 40% of global cocoa production. In

the 2001 season, Côte d'Ivoire exported more than 1.4 million tons of cocoa. Cocoa contributes approximately 40% of exports, 14% of GDP, and more than 20% of government income (Save the Children Canada, 2003). As the international movement against the use of child labor in cocoa production grows (Save the Children Canada, 2003), the need for a more precise and detailed analysis of child labor becomes apparent. This analysis will help to further improve awareness and understanding, and also reinforce efforts to deal with child labor.

According to the International Labor Organization (ILO/SIMPOC, 2002), sub-Saharan Africa has the highest rate of child labor. Most of these children are involved in agricultural work, predominantly on farms operated by their families, and not paid for their labor. Addressing this problematic issue of child labor is vital to the development of many African youths, who are the future of sub-Saharan Africa. The child labor issue will be central in the fight against poverty.

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The most common response to child labor has been to legislate against it (Bonnet, 1993; White, 1994). However, legislation typically covers the formal sector, whereas, in Africa, we are mainly dealing with an agricultural society in which child labor occurs within the household. A recent investigation by the International Institute of Tropical Agriculture (IITA) in Côte d'Ivoire revealed that most of the children employed on cocoa farms belong to the household, whether as family or foster children (IITA report, 2002).

The empirical fact that the majority of children working in the cocoa sector works on household-run farms should motivate the modeling of farmer households. This study focuses on family-controlled child labor taking place in the cocoa sector of Côte d'Ivoire.

Some authors argue that African rural societies do not consider child labor a delinquent activity, and consider that the productive activity of a child living in a rural and traditional environment is a means of social integration and should be regarded as teaching the child survival skills (Bekombo, 1981; Grootaert and Kanbur, 1995). This view does not consider child labor in a traditional environment as a problem *per se*, but as a form of “on-the-job” training. On the other hand, childhood is probably the best time for knowledge acquisition from formal education. In this sense, it is natural to see going to school as the preferred alternative to working (Grootaert, 1998; Heady, 2003). In between, we find multiple variations of combinations of work and school. An important question usually asked is whether or not working in the farm means the child is unable to attend school. Hence, understanding the participative behavior of the household in the decision of whether to send a child to school and/or to work could help in designing more appropriate education and labor policies that would get rid of the obstacles to one of the most important long-term objectives of any poverty-conscious economy: the training of tomorrow's human resources. From past studies on child labor (Andvig, 2001) children in developing countries are often prompted to work by their parents. Siddiqi and Patrinos (1996) reported that children make their own decisions to work only 8% of the time. Consequently, we assume in our analysis that decisions on whether to go to school or to work are taken by the parents at the household level and not at the child level. Therefore, analysis of the household framework is necessary for meaningful policy outcomes.

Several studies have examined the determinants of child labor and schooling in rural Africa (Andvig, 2001). However, although past studies focused on child labor in economic activities in general, they did not facilitate the understanding of the specificity of the issue in some major sectors. This article brings in fresh information by evaluating child labor in the cocoa sector in Côte d'Ivoire. The study will attempt to identify certain key factors governing child labor and schooling in the cocoa sector.

The article is divided into six sections. Section 2 describes survey methods and data sources. Section 3 presents the economic model used in this article. Section 4 presents the empirical model specification, while section 5 discusses results.

The article ends in section 6 with conclusions and some policy lessons for eliminating exploitative child labor in cocoa farming and ensuring higher participation in schools.

## 2. The problem of child labor in the cocoa sector

In 2000, the ILO estimated that 211 million children between the ages of 5 and 14 were economically active worldwide. Since the adoption of ILO Convention 182 on the worst forms of child labor in 1999, and that of ILO Convention 184 on safety and health in agriculture in 2001, there has been a growing awareness of the need for research on the extent and nature of children's agricultural work to determine the types of activities that place children at risk. With the vast majority (70%) of the world's working children in agriculture, these two international standards provide important guidance for addressing the needs of children engaged in hazardous work in this sector.

Recently, a number of reports on child labor on cocoa farms in West Africa and Côte d'Ivoire in particular have been issued by foreign governments, international agencies, nongovernmental organizations (NGOs), and the media. These reports have increased awareness of child labor practices in the cocoa sector. The campaigns, media reports, public concern, and calls for legislation created by the issue have assumed particular importance because approximately two-thirds of the world's cocoa is produced in West Africa.

Taking the social, moral, and economic responsibility for this, the cocoa and chocolate industry developed in 2001 a protocol<sup>1</sup> to better identify and address instances of child labor abuse in growing cocoa. Witnessed by the U.S. and Ivorian governments, the ILO, and other international and nongovernmental organizations concerned, the Harkin-Engle Cocoa Protocol sets a roadmap for eliminating the worst forms of child labor on cocoa farms. One of the first steps planned in the protocol was an investigative survey in the region to identify offending cocoa farms and the prevalence of child labor. The IITA and a local, private research firm, called the Center of Prospective and Applied Research on Social Politics and Social Security Systems (CEPRASS) in close collaboration with the Program for the Elimination of Child Labor of the ILO (ILO/IPEC) undertook investigative surveys of child labor practices on cocoa farms, to establish the extent of such practices. These surveys were funded by the U.S. Agency for International Development (USAID), the U.S. Department of Labor (DOL), and the global

<sup>1</sup> Protocol for the Growing and Processing of Cocoa Beans and their Derivative Products in a manner that Complies with ILO Convention 182 Concerning the Prohibition and Immediate Action for the Elimination of the Worst Forms of Child Labor. Also known as the Harkin-Engle Cocoa Protocol (Save the Children Canada, 2003). The cocoa and chocolate industries that participated in the development of the protocol include Chocolate Manufacturers Association, Association of Chocolate, Biscuit, and Confectionery Industries of the European Union, Confectionery Manufacturers Association of Canada, European Cocoa Association, the International Cocoa Organization, International Confectionery Association, Cocoa Merchants Association of America, Federation of Cocoa Consumers, and World Cocoa Foundation.

chocolate industry. To provide technical input and an oversight of the survey process, a Technical Advisory Committee of independent experts was drawn from national and international research institutes, United Nations agencies (ILO, UNICEF, FAO), NGOs, and the governments of Côte d'Ivoire, Nigeria, Ghana, and Cameroon. This Committee has worked to ensure the credible implementation of the surveys. The present article is a product of these surveys, and the authors were involved in the survey design and collection/supervision of the data collection and analysis.

### 3. The cocoa labor tasks, the survey and the data

The Ivorian cocoa production is overwhelmingly in the hands of small family farmers who mainly employ family labor (Nkamleu and Ndoye, 2003). Ninety-eight percent of the farms have less than 12 ha of productive cocoa farmland, with an average farm size of around 4 ha. This is in contrast to many other African agricultural export crops, such as tea, tobacco, and fruit, that tend to be produced on larger commercial plantations with higher numbers of employed tenants, sharecroppers, and other hired hands. The labor intensity of the cocoa farm and, subsequently, the labor input, fluctuate over the year with the main peak season during harvest time in September and October. The labor demand relates to certain major tasks that have been organized in the survey in 11 categories.

#### 3.1. Weeding

Weeding of the farm is typically undertaken twice a year, first in May/June and again prior to the harvest season in September/October. This activity is carried out using a sharp cutlass or machete and is, therefore, viewed as a potentially hazardous occupation for any worker but especially for children whose muscles, focus, and coordination may be insufficiently developed. Weeding must moreover be considered as extremely hard work.

#### 3.2. Field preparation

After weeding, the debris has to be carried out of the cocoa farm.

#### 3.3. Farm upkeep

The farmer will sporadically trim the cocoa shoots and regulate the shade canopy. He will also, usually in conjunction with the other labor tasks, conduct a phytosanitary harvest, which consists in removing diseased pods from the trees and the farm.

#### 3.4. Agrochemical (fertilizers and pesticides) application

Because of the heavy incidence of cocoa blackpod disease and capsid insects, most producers spray the cocoa trees with fungicides and insecticides. An important number of producers

also apply fertilizers. Both products pose potential health hazards; protective equipment and thorough training are required to prevent any harm to those applying them. Children are likely to handle these substances with less caution and, moreover, to be at a higher risk for developmental harm than adult laborers.

#### 3.5. Harvest

Once the pods are ripe, the most labor-intensive season on the cocoa farm begins. The ripe cocoa pods are cut down from the trees, again with a machete. The workers require some experience to be able to differentiate ripe pods from unripe pods.

#### 3.6. Pod collection

After the cocoa pods have been cut down, they are collected and transported to a central location typically within or at the edge of the cocoa farm. This task could be considered one of the heaviest on the farm.

#### 3.7. Pod breaking

At the site of collection the cocoa pods are broken and the wet beans separated from the mucilage of the pod prior to fermentation. Only the pod cutting requires the use of a machete. Many in particular, children would primarily be employed in extracting the wet cocoa beans from the opened pod.

#### 3.8. Transport

After the wet beans have been separated from the pods, they are transported to the place where they will ferment and get dry. In most cases, transport is from the cocoa farm to the farmers' concession in the village. The distance may be short, for farms located in the forest zone, or very long, particularly when the farmers live in more urbanized village areas. We must again assume that this is one of the heaviest tasks of the farming process.

#### 3.9. Fermentation

After the cocoa beans have been extracted they are fermented for four to seven days depending on the producer. The process involves mixing the beans every 48 hours. Besides that, guarding the beans requires labor input as theft of cocoa beans is not uncommon.

#### 3.10. Drying

Once the cocoa ferments, it is dried in the sun or in ovens. Again, the beans need to be guarded as well as handled throughout the drying process.

In order to obtain information on the state of child labor utilization in the cocoa sector in Côte d'Ivoire, the extensive national survey mentioned in the previous section was conducted in 2002. A national census of cocoa producers was conducted in 1998. The database of this census was used to randomly select households of cocoa producers to be surveyed. A total of 1,501 households and over 250 villages, hamlets and cocoa "camps" across the cocoa belt in Côte d'Ivoire were visited. All villages and clusters of households were selected using a stratified random sampling procedure, and randomly selected household heads were interviewed using structured questionnaires.<sup>2</sup> This was complemented by a qualitative survey with informal interviews conducted at the community level. Detailed information pertaining to work conditions and other socioeconomic characteristics of households and their members were collected. All household heads surveyed were cocoa producers operating their own cocoa farms. Among them, less than 2% were female household heads. The 1,501 households surveyed consisted of 11,669 people, of which 1,490 (12.8%) were household heads, 1,910 (16.4%) were spouses, and the rest 8,289 (70.8%) were other family members.<sup>3</sup> Among the "other family members" 5,263 (45.1%) were biological children of the heads of the households, while 2,622 (22.5%) were extended family members and 384 (3.3%) were members having no family ties to the household heads (Table 1). Cocoa is essentially a man's crop. It was thus not surprising that less than 2% of household heads were female. We should also note that children (0–17 years), represent 46.3% of household individuals.

Although the 1989 UN Convention on the Rights of the Child defines children as all individuals under the age of 18, the child labor literature tends to concentrate on the age group 6–14 years. This is justified by the fact that the 1973 ILO Convention 138 (the Minimum Age Convention) establishes that "... the age of admission to employment shall not be less than the age of completion of compulsory schooling and, in any case, shall not be less than 15 years." Children under six have generally been considered to be too young to participate substantially in the labor force. Looking at the joint decision on child labor and schooling it would also make little sense to include 15–17 year olds who are beyond compulsory school age and are rarely in school in the areas studied. Therefore, in the analyses that follow, we have used the 6–14 age group in the econometric model.

#### 4. Conceptual model

Cocoa farmers in Côte d'Ivoire must decide whether to send a child to school or to work on cocoa farms. There are several ways to econometrically model child labor and schooling. Contemporary labor economics employs theories of choice to

Table 1  
Frequency and percentage of household members by category

	Frequency	Percentage (%)
<i>By category</i>		
Household head	1,490	12.8
Spouse	1,910	16.4
Biological children	5,263	45.1
Extended family	2,622	22.5
Member having no family ties to the household head	384	3.3
Total	11,669	100
<i>By age-group</i>		
<6 years	1,744	14.9
6–9 years	1,488	12.8
10–14 years	1,445	12.4
15–17 years	718	6.2
18 and over	6,274	53.7

analyze and predict the behavior of labor market participants (McConnell et al., 1989). In this study, we attempt to answer questions such as: Why do some parents choose to delay the entrance of their children into the cocoa labor force in order to attend school? Why do some parents<sup>4</sup> decide to employ their children on cocoa farms while others do not? Why do some parents decide that a child will combine work and school?

Economists investigating choice decision have accumulated considerable evidence showing that the observed choice decision on a technology or a behavior is the end result of a complex set of inter-technological preference comparisons. Despite all the development in decision theories by anthropologists, sociologists, and philosophers, farmers today still largely rely on perception and intuition for decision-making. Variables that affect farmers' access to information, and hence their perception (e.g., extension, education, media exposure, individual characteristics, etc.), are typically used in economic models of the determinants of adoption (Kebede et al., 1990; Nkamleu and Adesina, 2000; Polson and Spencer, 1991). Several empirical studies have tried to identify the influence of socioeconomic variables on child labor and schooling. In most cases, Probit, Logit, or Bivariate Probit model is applied (Andvig, 2001; Coulombe, 1998). In these models, the farmers' decision is assumed to be of a dichotomous nature.

A multinomial logit model (Cramer, 1991; Madalla, 1983) is used in this analysis. The advantage of the multinomial logit is that it permits the analysis of decisions across more than two categories, allowing the determination of choice probabilities for different categories of child exploitation. This approach is more appropriate than the probit or logit models that have been conventionally used. Grootaert (1998) also presented multinomial results of child labor in Côte d'Ivoire. Instead of having dichotomous alternatives (0, 1) as in the multivariate logit or probit models, the multinomial logit has  $S$  possible states or

<sup>2</sup> The survey is described in detail in the IITA report (2002).

<sup>3</sup> This is the category which is analyzed in this article.

<sup>4</sup> Throughout the text, the concepts "cocoa farmer," "parent," and "household head" are used indiscriminately.

categories that is  $s = 1, 2, 3, \dots, S$ , that are exclusive and exhaustive (Nkamleu and Coulibaly, 2000). In this analysis, the four categories considered are given below:

1. Not working on cocoa farm and not going to school (None).
2. Going to school and not working on cocoa farm (School only).
3. Working on cocoa farm and not going to school (Work only).
4. Working on cocoa farm and going to school (School and Work).

Because the multinomial logit model does not treat these categories in any continuous order, it is different from ordered or sequential logit/probit models (Ameniya, 1981).

If there is a random sample of farmers,  $I = 1, 2, 3, \dots, N$ , given four choice categories,  $s = 1, 2, 3, 4$ , the multinomial logit model assigns probabilities  $P_{is}$  to events characterized as “ $i$ th child in  $s$ th category.” The vector of the characteristics of the child is denoted by “ $z$ .” To estimate this model there is need to normalize on one category, which is referred to as the “reference state.” In this analysis, the first category (None), is the “reference state.” Our multinomial logit model for choice across  $S$  states ( $s = 1, 2, 3, 4$ ) can then be specified as:

$$P(Y = s) = \frac{e^{\beta_i Z}}{1 + \sum_{j=2}^S e^{\beta_j Z}} \quad \text{for } s \text{ not equal to } 1$$

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

The parameters  $\beta_i$  are estimated using LIMDEP<sup>©</sup> (Greene, 1993).

## 5. Empirical model

In this section, we present the variables used in the estimation. The dependent variable, which has four possible categories as stated above, was constructed from two dichotomous variables “work” and “school.” These two variables were dummy variables for whether the child was working or going to school. The data set at hand was collected with the particular purpose of studying child labor in cocoa production, and thus includes extraordinary variables in terms of, for instance, task specificity. It therefore allows for rare analytical opportunities. One variable of main interest “work on cocoa farm” is captured by labor participation, which indexes whether the child effectively takes part in cocoa work or not. It is however, a limitation that the available data focus on child labor *participation* rather than on, for instance, the *number of hours* worked. Based on previous research, we assume, however, that the *labor participation* measurement works as a decent indication of child labor utilization. Also, the variable available for measuring school was school

enrollment rather than, for instance regular attendance. In Côte d’Ivoire, even though school usually lasts only around six hours per day, the principal time constraint is related to the distance between school and the village. This can vary enormously from one community to another.

Previous studies in sub-Saharan Africa suggest that labor participation is influenced by different characteristics of the child, the parents, and the household. Consequently, these factors are assumed to be important determinants of work/school participation. A total of 23 independent variables have been included in the empirical model. The descriptive statistics of these variables are given in Table 2. The discussion and justification of the independent variables included in the model are provided below.

### 5.1. Child characteristics

MALE\_CHILD indexes the gender of the child (0 = female, 1 = male). Some authors have emphasized that boys are more likely to be involved in the labor market while girls are more likely to do more housekeeping work (Patrinos and Psacharopoulos, 1995; Psacharopoulos and Arriagada, 1989). A recent study by Canagarajah and Coulombe (1998) in Ghana came out with gender discrimination, with boys being more likely to go to school than girls. We expected MALE\_CHILD to be positively related to both WORK and SCHOOL.

AGE\_CHILD is a variable that measures the child’s age in years. Most activities on cocoa farms are heavy tasks that are not appropriate for children with inadequately developed muscles. It is therefore more likely that older children will be more involved in work on cocoa farms. Also due to the delay in enrolling children in school, it is more likely that older children will be enrolled in school. We hypothesized AGE\_CHILD to be positively related to WORK and also positively related to SCHOOL. The model includes a quadratic in child age to determine any nonlinearity in the relationship.

BIOLOGICAL\_CHILD is a dummy variable equal to one, if the child is a biological child of the household head, and to zero otherwise. In the sample used for econometric estimation (6–14 years), 74% were biological children, 24% were other kin, and only 2% were nonkin children. Kinship fostering or guardianship of orphans and other children is a common practice in Africa (Case and Albeidieger, 2002). However, inheritance laws favor biological sons/daughters over foster children. Work experience is especially valuable for the children (especially the male children) of landowners, who can expect to inherit the farm (Bhalotra and Heady, 2001). We expect biological children to be more likely to work on cocoa farms in preparation for inheritance.

A phenomenon discussed in the child labor literature is the impact of family ties on school enrolment (Case and Albeidieger, 2002). Children who are cared for by adults other

Table 2  
Descriptive statistics for the variables used in the econometric model

Variable	Description	Mean	Standard deviation	Minimum	Maximum	Number of cases
Child characteristics						
MALE_CHILD	Gender dummy of the child. 1 = male; 0 = female	0.55	0.50	0	1	2,917
AGE_CHILD	Age of the child in years	9.58	2.54	6	14	2,920
AGE_CHILD SQUARE	Square of age of the child	98.12	50.03	36	196	2,920
BIOLOGICAL_CHILD	Dummy for child being the biological child of household head, 1 = yes; 0 = no	0.74	0.44	0	1	2,920
Parent's characteristics						
COCOA_EXPERIENCE	Producer's cocoa farming experience in years	20.31	10.77	1	69	2,875
AGE_PRODUCER	Age of the producer	52.57	13.71	20	110	2,893
EDUCATION_PRODUCER	Producer's educational attainment 1 = no formal education; 2 = primary school; 3 = secondary 1; 4 = secondary 2; 5 = postsecondary	1.56	0.77	1	5	2,905
MIGRANT	Dummy for whether the producer is a migrant from another region of the country (national migrants), 1 = yes; 0 = no	0.25	0.43	0	1	2,920
IMMIGRANT	Dummy for whether the producer is an immigrant from another country (international migrants), 1 = yes; 0 = no	0.21	0.41	0	1	2,920
Household characteristics						
HOUSE QUALITY	Index composed by standard quality of wall and roof material, Lowest = 0; medium score = 1; highest score = 2	1.00	0.77	0	2	2,920
HOUSEHOLD SIZE	Number of household members	10.43	4.60	2	36	2,604
HOUSEHOLD SIZE SQUARE	Square of household size	129.94	127.47	4	1,296	2,604
DEPENDENCY RATIO	Share of household members <6 and >55	0.21	0.14	0	0.75	2,660
Farm characteristics						
COCOA FARM AREA	Productive cocoa farm size (ha)	3.98	3.88	0	45	2,891
FOOD CROP AREA	Food crop farm size (ha)	3.64	9.84	0	150	2,522
OTHER CASH CROP AREA	Other cash crop farm size (ha)	2.74	5.86	0	75	2,503
COCOA PRODUCTIVITY	Yield per hectare, 1 = Low; 2 = Medium; 3 = High	2.01	0.80	1	3	2,697
NUMBER OF SHARECROPPER	Number of sharecroppers working with household head	0.55	0.96	0	6	2,920
Community characteristics						
COCOA FARMLAND IN THE CLUSTER	Average size of cocoa farms within region (ha)	3.62	1.17	2	9	2,920
COCOA PRODUCTIVITY IN THE CLUSTER	Average productivity class of cocoa in the region	1.82	0.33	1	2.8	2,920
NON-COCOA FARMLAND IN THE CLUSTER	Average size of noncocoa farms within region (ha)	4.95	3.03	1	17.5	2,920
HOUSE QUALITY IN THE CLUSTER	Average housing standard in region	0.95	0.31	0	1.6	2,920
WEST	Dummy variable for Western region, 1 = west; 0 = otherwise	0.09	0.29	0	1	2,920
EAST	Dummy variable for Eastern region, 1 = East; 0 = otherwise	0.21	0.41	0	1	2,920
CENTER-WEST	Dummy variable for Center-West region, 1 = Center-West; 0 = otherwise	0.41	0.49	0	1	2,920

than their biological parents have been found to be disadvantaged. We therefore hypothesized a positive relationship

between BIOLOGICAL\_CHILD and both WORK and SCHOOL.

### 5.2. Parent characteristics

COCOA EXPERIENCE measures the household head's number of years of cocoa farming experience. With experience it is expected that farmers will be able to better assess the hidden wealth of cocoa farming. Grootaert and Kanbur (1995) argued that child labor is perceived as a process of socialization in many African countries. We have observed that experienced farmers tend to believe that working, as well as attaining formal education, enables a child to get acquainted with the necessary skills required for a better future. We hypothesized that the higher the experience, the more likely it is that the child will combine WORK and SCHOOL.

AGE\_PRODUCER measures the age of the household head. In an analysis of child labor incidence and determinants in Côte d'Ivoire, Grootaert (1998) found, both for urban and rural areas, that the older the head of the household, the more likely it is that a child will be attending school and not working. Based on that finding, we hypothesized that AGE\_PRODUCER is negatively related to WORK and positively related to SCHOOL.

EDUCATION\_PRODUCER measures the level of education of the household head (1 = no formal education; 2 = primary school; 3 = secondary 1; 4 = secondary 2; and 5 = postsecondary). This variable included those who had at least started (whether completed or not) the indicated level. The effect of education on child labor has been intensely debated. Empirical studies have shown that the level of education negatively affects the likelihood of child labor (Canagarajah and Coulombe, 1997; Coulombe, 1998). It is hypothesized that EDUCATION\_PRODUCER is negatively related to WORK and positively related to SCHOOL.

MIGRANT and IMMIGRANT are two binary variables, which index whether the farmer is a national migrant (MIGRANT) or international migrant (IMMIGRANT). MIGRANT takes the value 1 for a migrant and 0 otherwise. IMMIGRANT takes the value 1 for an immigrant and 0 otherwise. Migrants (as well as immigrants) are less likely to have access to much land. They may also be restricted to the use of land for perennial crops. This is because they generally acquire land either through begging or renting (Russell et al., 1990; Stier, 1982). Therefore, migrants will need more inputs to maintain an acceptable level of production. This pressure on child labor in cocoa farms might also restrict children from going to school. We therefore expect more children living in migrant (as well as immigrant) households to have a lower probability of school enrollment. It is hypothesized that MIGRANT and IMMIGRANT variables are positively related to WORK and negatively related to SCHOOL.

### 5.3. Household characteristics

HOUSEHOLD SIZE is the household family size. Generally, large households have more problems to resolve (sickness, etc.), which leave them with insufficient capital to send all the

children to school. Also, a large family may have more labor availability and hence, other members are able to take care of the cocoa farm, preventing children from working. It is hypothesized that HOUSEHOLD SIZE is negatively related to WORK and to SCHOOL.

The square of "family size" is included to determine any nonlinearity in the relationship.

DEPENDENCY RATIO represents the share of household members < 6 and > 55 years. Caring for young siblings and serving the elderly increase demand for housework substantially, reducing work in cocoa farms and school enrollment. In Ghana, Bhalotra and Heady (2001) found that the share of children under six in the household strongly increases housework child labor. We expected a negative relationship between DEPENDENCY RATIO and both WORK and SCHOOL.

Other authors have been concerned with the two-way relationship between fertility choices and schooling/child labor (Coulombe, 1998). In the case of our data, we found that running Multinomial Logit with and without HOUSEHOLD SIZE and DEPENDENCY RATIO did not affect other estimates.

COCOA FARM AREA is the measure of cocoa land size in hectare. As farm size increases, farmers need more labor inputs (Kebede et al., 1990). An increase in cocoa size is likely to increase the use of child labor and decrease schooling. We hypothesized that COCOA FARM AREA is positively related to WORK and negatively related to SCHOOL.

FOOD CROP FARM AREA and OTHER CASH CROP AREA are respectively the food crop farm sizes and other perennial crop farm sizes. Since the survey did not collect data on child labor in noncocoa farming, these two variables are introduced to proxy the demand for child labor in noncocoa farm activities. Farmers with large noncocoa land resources, other things being constant, will need more labor to take care of these lands and therefore, lower participation on cocoa farms and enrollment in school can be hypothesized. We expected FOOD CROP FARM AREA and OTHER CASH CROP AREA to be negatively related to both WORK and SCHOOL.

HOUSE QUALITY is the variable measuring the housing quality of the main household building. Based on our observations in rural Africa, where information on income and consumption can be difficult to obtain and to assess in a reliable way, house quality is quite a good proxy for welfare. Houses with fragile walls and straw roofs are thus in this context given the lowest wealth score (=0). Houses with either solid walls or solid roofs are given a medium score (=1), while houses built with bricks and with iron sheets or other forms of solid roof are given the highest wealth score (=2).

NUMBER OF SHARECROPPERS is the number of sharecroppers working with the household head. One advantage of sharecropping to the landlord is that it improves the landlord's access to labor by making the labor of the tenant's family available, in addition to the labor of the tenant (Basu, 1997). Hence, school-aged children are able to attend school and not to work. It is hypothesized that NUMBER OF SHARECROPPERS is negatively related to WORK and positively related to SCHOOL.

COCOA PRODUCTIVITY represents the level of cocoa productivity. Farmers are divided into three equal cocoa productivity classes (terciles) coded 1 = Low; 2 = Average; 3 = High. While a past study has emphasized the role of farm size on child labor (Bhalotra and Heady, 2001), other authors have argued that, in addition to farm size, information about land quality and productivity could strengthen the ability to assess opportunity cost to nonlabor options (Cocburn, 2000; Coulombe, 1998). In cocoa production systems, there is a high correlation between productivity and the use of chemical inputs. Farmers having high productivity are those using labor demanding chemical inputs, particularly fungicides and fertilizers. On the other hand, farmers having high productivity are more likely to be able to afford school fees for their children. It is therefore hypothesized that COCOA PRODUCTIVITY is positively related to both WORK and SCHOOL.

#### 5.4. Community characteristics

Cocoa production typically takes place in areas where child labor is common, and where children and adults, to some extent, may substitute for one another in different types of labor. Child labor participation in cocoa farming should be therefore partly decided by the external labor demand for both adults and children in other labor sectors. The present survey focused only on child labor in the cocoa sector and did not collect information on whether or not the child is working outside the household sphere. To circumvent this limitation, we therefore introduce proxies for the demand from the most likely places of work that would “compete” for the labor available. We assume that increased labor demand in workplaces that typically demand adult labor will increase child labor participation on the cocoa farm, as family children will substitute for adult workers. Increased demand in typical child labor tasks will, on the other hand, pull children away from cocoa farming.

COCOA FARMLAND IN THE CLUSTER and NONCOCOA FARMLAND IN THE CLUSTER are respectively the average size of cocoa farms in the sample cluster (the *sous-prefecture* or commune) and the average size of other perennial crop (noncocoa) farms in the region. It is expected that the greater the size of farmlands in the area, the higher the community farm labor demand that will compete with child labor on household cocoa farms. In the same manner, we expect COCOA PRODUCTIVITY IN THE CLUSTER (average productivity class of cocoa in the cluster) to be negatively related to child work and schooling.

HOUSE QUALITY IN THE CLUSTER represents the average household quality in the cluster (“*sous-prefecture*” or “*commune*”). This is a good proxy for community wealth. Wealthier communities are better-off in terms of apprenticeship opportunities as well as salaried domestic services that can pull children away from farming activities.

WEST, EAST, and CENTER-WEST are dummy variables taking the value of 1 for farmers in the corresponding area

and 0 otherwise. Regions are not homogeneous in terms of agricultural opportunities, potential for employment in farming and nonfarming activities, quantity, quality, and distribution of school infrastructure. The regional factor will normally have an impact on the pattern and intensity of child labor and school attendance.

Past studies acknowledge the particular risk of endogeneity related to certain core independent variables when examining issues such as child labor. Most prominently, household income assessment maybe endogenous, as children often contribute to the household income level through their labor. In this analysis the potential endogeneity problem of household wealth is reduced by the fact that we examine only child labor delivered to one of the potential labor markets available to the household members. We, moreover, assume that the *house quality* wealth proxy is less potentially risky than the direct assessment of income or consumption. With regard to productive land size, cocoa farming is less flexible than most other types of farming, in the sense that it takes approximately seven years to obtain productive cocoa trees. Cocoa farming is therefore not very suitable for a flexible adjustment based on what labor might be available at any given time. There is, moreover, a significant scarcity of cocoa farmland in the areas studied, something that would further complicate such adjustments of landholdings based on child labor availability.

Cocoa productivity is of a much more central concern as it could potentially bear a high risk of being endogenously related to child labor input in cocoa farming. This problem was tackled using the instrumental variable procedure developed by Rivers and Vuong in 1988 (Wooldridge, 2002). In a first step, we ran an OLS regression (prediction equation) of the productivity variable on a series of exogenous variables. Secondly, we used the estimated residuals from the first step and the predicted COCOA PRODUCTIVITY from the first regression as regressors in our multinomial logit regression. The significance level of the coefficients on the residual variable forms the basis of the exogeneity test.<sup>5</sup>

## 6. Results

### 6.1. Field survey results

Table 3 shows the gender and age distribution of household members participating in specific labor tasks on the cocoa farm. In total 53.7% of household children aged 6–17 participate in at least one of the tasks on the cocoa farm. The figure is more considerable for 15–17 year olds (78%), lower for 10–14 years olds (63%), and lowest for 6–9 year olds (33%). Although less

<sup>5</sup> This procedure requires that the auxiliary regression (OLS regression) includes at least one variable that does not directly determine the outcome, i.e., is excluded from the regression outcome (multinomial regression) or is an instrument. In our estimation, “member of farmer organization” and “last year cocoa price” were used as instruments in the prediction equation and were both statistically significant.

Table 3  
Participation rate in labor tasks on age group and gender in percent of age group

	6–9		10–14		15–17		Adults		55 and over		All (6 and over)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Weeding	4.5	4.2	29.6	5.1	61.1	13.2	73.9	14.8	54.7	6.2	44.7	9.4
Field preparation	2.7	2.6	20.9	4.5	54.8	9.5	70.6	11.4	54.4	5.9	41.5	7.3
Farm upkeep	3.7	2.8	27.1	5.9	59.2	9.9	76.1	12.9	58.3	6.7	45.4	8.3
Pesticide	2.1	2.0	19.5	4.1	51.2	8.9	69.8	9.0	50.4	3.8	40.2	5.8
Fertilizer	1.4	1.9	18.2	3.7	50.0	7.9	67.9	9.2	49.1	3.1	38.9	5.7
Harvest	4.7	3.9	28.8	10.0	61.4	18.1	78.2	24.4	59.6	11.6	46.9	15.1
Pod collection	26.9	30.0	54.3	54.3	67.6	69.4	76.6	77.2	52.8	41.1	52.5	53.8
Pod breaking	14.3	13.9	46.8	31.2	68.6	46.1	81.3	52.6	61.5	36.6	52.6	35.7
Fermenting	3.7	3.8	23.0	8.1	55.8	16.8	72.5	18.4	53.7	10.0	42.7	11.9
Transport	10.6	14.9	39.3	26.8	60.4	43.1	73.8	52.0	51.2	25.2	46.4	34.0
Drying	6.0	8.0	27.5	15.9	59.2	22.7	74.1	31.0	57.4	14.3	44.9	20.0
At least one task	32.2	34.1	64.5	60.8	79.7	75.0	87.7	83.6	70.2	48.9	72.6	69.4
All tasks	1.4	1.9	17.7	3.3	49.5	7.6	66.8	8.2	48.2	3.1	38.3	5.2

than 2% of children 6–9 years old participate in all the tasks on the cocoa farm, 12% of those aged 10–14 and 32% of 15–17 do. So participating in all the tasks on the farm can most likely be interpreted as training to become future independent cocoa farmers, and thus has a valuable socialization value in addition to the productive value of the labor.

When cocoa farm labor is examined on a task-by-task basis, the three peak-season tasks are clearly the most labor demanding with overall household labor participation rates of 53% in *cocoa pod collection*, 45% in *cocoa pod breaking* and 41% in *field transport*. More than 28% of even the youngest children are found collecting cocoa pods, and, although the task is technically simple, it is also likely to be relatively heavy. Alongside cocoa pod collection, field transport and weeding should be considered to be the heaviest tasks in the production process. It is, therefore noteworthy that we find high rates of child participation in the first two, and high rate of participation by boys aged 10–14 in weeding. Beside being heavy work and thus physically straining, weeding the field using a machete has been argued to be a direct threat to a working child's safety. Labor involving the use of machete is defined by the ILO as a hazardous task, and, as we have seen, at least three of the tasks on the farm to some extent involve machete use. Among them, weeding is probably the most risky since it is simultaneously also very physically demanding. Less controversial is the claim that children should be kept away from agrochemicals such as fertilizer and pesticides. Children applying chemical substances are exposed not only to immediate physical injuries but are also at risk for serious developmental harm. Few of the youngest children participate in the application of agrochemicals, but as many as 13% of those aged 10–14, and 33% of 15–17 do this work. It thus appears as if child labor in hazardous occupations is considerable on the cocoa farms.

A few main patterns appear when closely examining Table 3. First, although a relatively equal share of boys and girls take part in at least one task on the cocoa farm, boys and men

have higher labor participation rates than girls and women in *all* tasks after the age of 10. The only exception is the collection of cocoa pods. In African agricultural systems, men are more often responsible for cash crop farming while women tend to handle subsistence farming. It is thus understandable that men gradually get involved in all the different tasks of the process, in preparation for independently managing a cocoa farm.

Second, while men are involved extensively in all parts of cocoa farming, it is clear that the labor of women and young children mainly is concentrated on the three clearly most labor-intensive tasks: the collection and breaking of cocoa pods and the transport of the cocoa from the field. This should indicate that women and children to some extent constitute the *adjustable labor force* of the cocoa farm. They will be pulled away from their usual tasks in housework and subsistence farming when the cocoa harvest demands it (Tørres, 2000).

Third, there is hardly any gender difference in the allocation of the labor participation of children between six and nine years of age. As children so young generally tend to belong to the mother's sphere, it is likely that they accompany and assist her in her farm labor.

Finally, when we look at the *distribution* of a girl's participation in the tasks, it is clear that it remains constant throughout her life: What she does more as a young child will still be what she does more as an adolescent, an adult, and even at old age. Boys, on the other hand, change their labor distribution pattern substantially by age. From a strong focus on the most labor intensive tasks, they gradually get involved in all the different tasks of the process. By the time they reach the 15–17 age group, they are intensively involved in all the tasks.

Table 4 shows the importance of children in the labor force used to perform different tasks. It is apparent that, overall, children, particularly biological children, constitute an important factor of production in the cocoa system.

Table 4  
Importance of different labor categories among labor force used

	Household head	Spouse	Biological son/daughter	Extended family	Member having no family ties
Weeding	13.6	20.6	43.6	18.7	3.5
Field preparation	28.0	25.8	30.3	14.3	1.6
Farm upkeep	25.5	17.2	33.7	21.2	2.3
Pesticide	30.5	10.6	33.1	21.9	4.0
Fertilizer	26.9	37.3	19.4	13.4	3.0
Harvest	15.1	32.7	32.8	17.1	2.3
Pod collection	2.2	38.6	36.7	18.9	3.6
Pod breaking	6.8	33.9	34.4	21.5	3.4
Fermenting	11.2	34.6	32.5	18.8	2.8
Transport	3.4	42.9	33.0	17.9	2.8
Drying	11.4	38.2	32.2	15.3	2.9
All tasks	37.3	5.6	36.0	16.6	4.4

The numbers refer to the shares (in %) of the labor categories in each of the tasks (i.e., each row sums to 100%, subject to rounding).

One of the concerns often raised over the issue of working children is whether or not they are enrolled in school. In a simple activity status classification, children can be classified under four mutually exclusive categories. 1—Going to school only; 2—Going to school and working on cocoa farms; 3—Working on cocoa farms only; and 4—Not going to school and not working on cocoa farms.

Table 5 shows the distribution of children (6–14 years) across the four categories by region and gender. The survey data shows that, first, 33.5% of children attend school and are not working in cocoa farm. Second, 28.7% of children combine schooling and work on cocoa farms. Third, 20% of children work on cocoa farms and are not attending school. Fourth, 17.8% are reportedly neither attending school nor working on cocoa farms. It is also obvious that nonenrollment in school is much higher in the Southwest [where only 53% (30.2 + 22.8) attend] and Western regions [where only 55.7% (30 + 25.7) attend]. The proportion

Table 5  
Activity status of children (6–14 years) by region and gender (%)

		Southwest (n = 815)	Center-West (n = 1,195)	East (n = 593)	West (n = 257)	All (n = 2,860)
School only	Boys	31.4	39.2	33.1	33.3	35.3
	Girls	28.9	30	39.7	25.7	31.2
	All	30.2	35.2	35.9	30	33.5
School and work	Boys	26.2	34.8	37	25.7	32.2
	Girls	19.2	29.2	22.6	25.7	24.5
	All	22.8	32.4	30.9	25.7	28.7
Work only	Boys	22.6	14.4	14.1	22.9	17.3
	Girls	26.6	20.6	21.4	30.1	23.5
	All	24.5	17.1	17.2	26.1	20
No school and no work	Boys	19.8	11.6	15.8	18.1	15.3
	Girls	25.3	20.2	16.3	18.6	20.9
	All	22.5	15.3	16	18.3	17.8
Total		28.5	41.8	20.7	9	100

School only = Going to school and not working in cocoa farm; School and work = Going to school and working in cocoa farm; Work only = Not going to school and working in cocoa farm; No school and no work = Not going to school and not working in cocoa farm.

is greater than 66% in other regions. At the same time, we observe that relatively more children in the South and West fall within the “work and no school” category; 24.5% of children in the Southwest and 26.1% in the West work on cocoa farms and do not attend school.

The survey data also show a distinct gender dimension. In all regions, the enrollment of girls in school is lower than that of boys. In general, 67.5% (35.3 + 32.2) of boys are enrolled in school against 55.7% (31.2 + 24.5) of girls. However, slightly more boys are employed on cocoa farms than girls (49.5% for boys against 48% for girls). Thus, relatively more girls are in the category of “no school and no work in cocoa farms.” The reason could be that girls are generally more employed in home chores and work on food crop fields.

## 6.2. Econometric model results

Results from the model for work/school are presented in Table 6. The parameters of the multinomial logit specification mentioned were estimated with 1993 observations using a maximum likelihood procedure. Percentages of correct prediction for each category are given in Table 7. The percentage of correct prediction is greater than 50%. The chi-squared value is also highly significant. The significance level of coefficients on the residual variable forms the basis of the Hausman–Wu test used to test for exogeneity. The null hypothesis of the exogeneity of productivity variable was rejected. Altogether, 17 of the 23 variables included in the model had significant effects in explaining work and/or school decisions. Predicted probabilities are computed to simulate the size of effects of some significant variables (Table 8).

## 6.3. Child characteristics

In the model, three variables directly characterize the child: gender, age, and his/her relationship to the head.

Table 6  
Multinomial logit model of work/school choice in the cocoa sector of Côte d'Ivoire

Variables	Coefficients					
	Work only		School only		Work and school	
	Coefficient	<i>t</i> -Statistic	Coefficient	<i>t</i> -Statistic	Coefficient	<i>t</i> -Statistic
ONE	-7.426	-3.397***	-5.521	-2.874***	-14.067	-6.714***
MALE.CHILD	-0.064	-0.370	0.450	2.928***	0.652	3.972***
AGE.CHILD	1.492	4.839***	1.308	4.801***	2.592	8.618***
AGE.CHILD SQUARE	-0.054	-3.427***	-0.061	-4.299***	-0.112	-7.283***
BIOLOGICAL.CHILD	0.220	0.869	0.485	2.149**	0.480	1.996**
COCOA.EXPERIENCE	0.010	0.640	0.001	0.109	0.008	0.545
AGE.PRODUCER	0.014	0.961	0.008	0.589	0.018	1.288
EDUCATION.PRODUCER	-0.132	-0.858	0.340	2.609***	0.257	1.871*
MIGRANT	0.481	2.075**	-1.159	-5.669***	-1.107	-5.069***
IMMIGRANT	0.044	0.182	-1.617	-7.446***	-1.861	-7.722***
HOUSE QUALITY	-0.223	-1.674*	0.101	0.856	-0.134	-1.067
HOUSEHOLD SIZE	-0.182	-2.015**	0.051	0.530	-0.189	-2.224**
HOUSEHOLD SIZE SQUARE	0.006	1.886*	-0.003	-0.805	0.007	2.336**
DEPENDENCY RATIO	-0.938	-1.378	-0.853	-1.419	-2.174	-3.367***
COCOA FARM AREA	0.068	1.520	-0.016	-0.392	0.039	0.904
FOOD CROP AREA	-0.011	-0.999	-0.003	-0.333	-0.014	-1.513
OTHER CASH CROP AREA	-0.023	-1.206	0.004	0.259	-0.050	-2.485***
PREDICTED PRODUCTIVITY	0.829	0.770	-0.636	-0.660	1.124	1.091
RESIDUAL	0.240	2.108**	0.152	1.507	0.339	3.123***
NUMBER OF SHARECROPPER	-0.208	-1.349	0.015	0.108	-0.333	-2.224**
COCOA FARMLAND IN THE CLUSTER	0.136	1.141	0.166	1.584	0.228	2.038**
COCOA PRODUCTIVITY IN THE CLUSTER	-1.593	-2.071*	-0.027	-0.039	-0.844	-1.157
NON-COCOA FARMLAND IN THE CLUSTER	0.149	3.506***	0.064	1.645*	0.177	4.441***
HOUSE QUALITY IN THE CLUSTER	-1.003	-2.629***	-0.952	-2.821***	-1.497	-4.146***
WEST	-0.321	-0.666	-0.721	-1.624*	-0.732	-1.562
EAST	-0.408	-0.890	0.179	0.458	0.299	0.721
CENTER-WEST	0.383	1.287	0.802	3.043***	0.712	2.536***

$X^2(54) = 962.115$ .

Percentage of correct predictions of child utilization categories = 51%.

Sample = 1993. \*\*\*Significant at 0.01, \*\*significant at 0.05, \*significant at 0.10.

MALE.CHILD is positively and significantly related to “school only” and “work and school” alternatives. This suggests that the probability of going to school alone and of combining school and work is higher for boys. This result corroborates recent findings by Grootaert (1998) in Côte d'Ivoire and Canagarajah and Coulombe (1998) in Ghana. AGE.CHILD is significant with expected signs in all choice categories. As expected, the older the child, the more it is likely that he or she will be involved in cocoa-farming activities and/or will be enrolled in school. The significance of the coefficients estimated on the quadratic term of child age in both equations suggests that this variable is related to work and schooling in a nonlinear way. The effect of AGE.CHILD on dependent variables declines at higher levels of AGE. Using the same variable, Grootaert (1998) found a markedly lower effect of age on “child labor only” and the combination of child labor and schooling. But the overriding difference is the effect of age on going to school and not working. While we find a strong positive age effect, the Grootaert study found that the age of the child was not a significant determinant of only going to school. BIOLOGICAL CHILD is significant and positively related to “school only” and “school and work.” This finding confirms the fact that children who are

under guardianship are disadvantaged (Ainsworth, 1996; Case and Albeidieger, 2002).

#### 6.4. Parent characteristics

Some parent characteristics are also relevant in explaining decision on child labor and school. Farmer education had a

Table 7  
Percentages of prediction for each child use categories

		PREDICTED				Total (n)
		None	Work only	School only	School and work	
ACTUAL	None	40.60%	16.72%	30.75%	11.94%	335.00
	Work only	9.85%	49.75%	13.38%	27.02%	396.00
	School only	12.17%	7.18%	52.26%	28.39%	641.00
	School and work	3.86%	13.69%	26.25%	56.20%	621.00
	Total (n)	277.00	384.00	654.00	678.00	1,993.00

Percentages are given by the ratio of number predicted in the category over total actual number. For the category “None” for example, % of correct prediction is 40.60% (136/335). The row total should be equal to 100%.

Table 8  
Multinomial logit model's predicted probabilities of child utilization choices by gender of the child, level of education of the household head and poverty status of the household

	Child is a boy			Child is a girl			
	Work only	School only	Work and school	Work only	School only	Work and school	
<b>Poor Farmers</b>							
<b>Education</b>							
None	0.209	0.292	0.377	None	0.306	0.256	0.270
Primary	0.152	0.341	0.405	Primary	0.234	0.314	0.305
Secondary-1	0.108	0.387	0.423	Secondary-1	0.173	0.372	0.332
Secondary-2	0.074	0.429	0.432	Secondary-2	0.123	0.426	0.350
<b>Medium farmers</b>							
<b>Education</b>							
None	0.177	0.343	0.350	None	0.263	0.304	0.253
Primary	0.127	0.395	0.371	Primary	0.197	0.367	0.281
Secondary-1	0.089	0.443	0.383	Secondary-1	0.143	0.427	0.302
Secondary-2	0.061	0.486	0.387	Secondary-2	0.101	0.482	0.314
<b>Rich farmers</b>							
<b>Education</b>							
None	0.148	0.396	0.320	None	0.222	0.355	0.234
Primary	0.105	0.451	0.335	Primary	0.164	0.421	0.255
Secondary-1	0.073	0.499	0.342	Secondary-1	0.117	0.482	0.270
Secondary-2	0.049	0.542	0.342	Secondary-2	0.081	0.538	0.277

Probability at the mean of all independent variables:

Work only = 0.178, School only = 0.363, Work and school = 0.323.

positive effect on child schooling as the only alternative and the combination of work and school, at 1% and 10%, respectively. This suggests that educated farmers have a better knowledge of the benefits of child education. Grootaert (1998) also found similar results, suggesting that low parental education should be used as a targeting variable for interventions. It also appeared that the origin of the farmer matters with regard to the use of children. Children of migrant farmers (national migrants) have a higher probability of being in the “working only” category. Moreover, migrants and immigrants (international migrants) are less likely to enroll children in school. This result strongly suggests that children living under the control of a native farmer are less likely to work and more likely to attend school.

### 6.5. Household characteristics

Five household characteristics were significant in explaining decisions on child labor and schooling. Our proxy of household welfare (HOUSE QUALITY) is significant and negative in the “work only” equation. This implies that children living in well-to-do houses are less likely to work on cocoa farms as their only activity. This finding supports the common presumption that child labor emerges from the poorest households (Andvig, 2001; Andvig et al., 2001).

As expected, the model shows that the household size is negatively related to “work only” and work/school combination. Large households are less likely to employ child labor or use school children on cocoa farms. The presence of siblings, particularly adult siblings, explains the lower tendency to rely on child labor. The dependency ratio negatively affects the choice

of work and school. Thus, the higher the dependency ratio, the lower the likelihood of children combining work and school. This contradicts the study of Grootaert (1998), which found no effect of siblings on child labor and schooling in rural areas of Côte d'Ivoire.

The size of other perennial crop farms is negatively related to the combination of work and school. Farmers with large noncocoa land resources, *ceteris paribus*, use supplementary labor to take care of these lands, and involvement on cocoa farms and enrollment in school are thus lower.

The number of sharecroppers working with the household head is significant and negatively related to the combination of work and school. This suggests that the presence of sharecroppers will lower the probability that children already in school will also work.

### 6.6. Community's characteristics

The average size of cocoa farms in the sample cluster is significant and positive in the work and school combination. Thus the greater the cocoa areas in the community, the more children will combine work and school. With regard to community and other perennial crop farm size, all coefficients are positive and significant. This confirms the fact that high community labor demand puts a strain on the availability of external labor, and that children, therefore, would be the most likely workers to replace family adults working on other farms.

The average housing standard in the community is significant and negatively affects all the three choice options relative to “neither” category. It is expected that the demand for

nonessential products and services would increase with the average local purchase power proxied by housing quality, and could represent, for instance, mechanical services related to increased ownership of technical equipment and vehicles, as well as demand for “luxury” services from hairdressers and tailors. This could be assumed to represent an alternative to the demand for labor not related to agriculture. The comparative advantage of sending children for apprenticeship as mechanics or tailors, for instance, increases with the presence of such craftsmen and with increasing local demand for their services. This pulls children away from cocoa farms and from schools.

In the same manner, as expected, average productivity of cocoa in the cluster is negatively related to child work. The higher the cocoa yield per hectare in the community, the lower the use of child labor in household cocoa farms. High productivity of cocoa farms in the community will increase marginal returns to child labor working on outside cocoa farms. Attracted by high salaries, children will be pulled away from household cocoa farms, and there will be a turn towards nonhousehold cocoa farms.

Finally, regional variables show that children from the Western region are less likely to be enrolled in school only; in the Center-West, children are more likely to be in school only or to combine school and work. Thus, the Western region is the “worst” zone, and should consequently be given priority during interventions.

The multinomial logit does not share the monotonic behavior of the binomial logit probability. Hence, the usual focus in the literature is on coefficient estimates rather than marginal effects. Because (as noted by Greene (1991, p. 478); Greene (1993, p. 667); and Cramer (1991, pp. 46–47)) the marginal effects depend on the point of evaluation and due to the nonmonotonic nature, the marginal effect can vary in sign according to the value of the dependent variable. Thus, there is some potential for confusion, as marginal effects coefficients need not have the same sign as model coefficients.

A convenient way of demonstrating the size of effects is to work out the estimated probabilities for several stereotype households. The estimated coefficients in the multinomial logit model were used to calculate the predicted probabilities of farmers’ decision on child labor/school. Three significant factors are varied here: one child characteristic (gender of the children), one parent characteristic (level of education of the household head), and one household characteristic (household wealth proxy). Results (Table 8) confirm that the probability of working and combining school and work were higher for boys than girls, regardless of the level of education and poverty status. It also appears that, while the probability of working declines with an increasing wealth status, the probability of schooling increased with household wealth. This result also highlights the strongest effect of education on both child work and schooling. Parents with no or low education are more likely to choose work options for their children. This underlines the transgenerational aspect of lack of schooling and child labor. It

also shows the disadvantaged position of girls *vis-à-vis* boys. The continuous promotion of girls’ education through appropriate incentives must thus remain a priority in the cocoa area of Côte d’Ivoire.

It is often asked what effect cocoa prices have on child labor participation. The quantitative data collected could not help to answer this important question. However, qualitative data from open interviews with community leaders indicated that a greater employment of family labor was a common response to the recent drop in cocoa prices and the crisis in cocoa incomes. In addition to the substitution of family labor for paid labor, farmers have also reduced the use of purchased inputs. The net effect of both of these factors has led to lower productivity and incomes and, perhaps most importantly, to reduced household investment in children’s education.

## 7. Conclusion

Child labor in the cocoa sector in Côte d’Ivoire has caught the attention of the general public, and raised a debate on trade sanctions on cocoa produced under such conditions. It is obscured from the public view that the vast majority of working children in the cocoa sector are predominantly family-controlled child labor.

Based on a survey carried out in 2002 over a sample of more than 1,500 cocoa farmers, using the multinomial logit model, this article identifies factors that affect farmers’ decisions across different categories of child utilization. The main objective was to identify variables that could help to design an array of usable policy instruments for the promotion of the good development of children.

Survey data reveal that 53.7% of household children aged 6–17 participate in at least one of the tasks on the cocoa farm. The figure is considerable for 15–17 years (78%), lower for those aged 10–14 years (63%) and lowest for those aged 6–9 years (33%). While less than 2% of children aged 6–9 years participate in all the tasks on the cocoa farm, 12% of those aged 10–14 years, and 32% of those aged 15–17 year olds do. On a task-by-task basis, we find a significantly greater mobilization of this labor type in cocoa pod collection, cocoa pod breaking, and field transportation. It was also noticed that many children are involved in potentially dangerous and/or injurious tasks, such as pesticides application and weeding. Data also highlight gender differences in the allocation of the labor participation of children among tasks.

Classifying children (aged 6–14 years) into four mutually exclusive categories according to their work/schooling status, data collected reveal that 33.5% of children attend school and are not working on cocoa farms, 28.7% of children combine schooling and work on cocoa farms, 20% of children work on cocoa farms as their sole activity. Finally, 17.8% are reported to be not in school and not working in cocoa. These findings suggest that child labor in cocoa farming as well as nonenrollment in school are both important.

The econometric analysis highlighted the effect of socio-economic factors on child labor and schooling. Results generally indicated that:

1. Older children, children of migrant farmers, children from smaller families, children from the poorest families, children living in communities with low average cocoa productivity, children living in communities with higher average noncocoa perennial crop areas, and children living in the poorest communities are more likely to work on cocoa farms and not attend school (work only).
2. Boys, older children, biological children of the household head, children of more educated farmers, children of native farmers, children living in communities with higher average noncocoa perennial crop areas, children living in the poorest communities, and children not living in the Western region are more likely to be going to school and not working on cocoa farms (school only).
3. Boys, older children, biological children of the household head, children of more educated farmers, children of native farmers, children from smaller families, children from households with a lower dependency ratio, children living in households with lower noncocoa perennial crop areas, children living in households employing a lower number of sharecroppers, children living in communities with higher average cocoa farming areas, children living in communities with higher average noncocoa perennial crop areas, children living in the wealthiest communities, and children living in Center-West province are more likely to be combining school and work on cocoa farms (school and work).

These findings have important implications for current efforts to reduce child labor participation in export cocoa farming. While the main current initiatives focus on—and need to continue to focus on—improving the welfare of the farmer and the rural community, it is important to keep in mind that improving the wealth of rural communities' will inevitably increase the return to each unit of child labor in nonfarm activities. In such a case, nonfarm sectors will attract both children actually working on cocoa farms and children in school. Thus, solving the cocoa child labor problem may result in a new problem unless parallel interventions aiming to prevent such side effects are simultaneously implemented.

This article also shows how other family-owned cash crop farms pull children away from cocoa farms and the work/school combination. A high household dependency ratio, indicating housework demand, also pulls children away from the cocoa farm/school combination. We have noticed how children are kept out of both farming cocoa and schooling in wealthier communities. We suggest that local apprenticeship opportunities as well as remunerated domestic services in better-off households in the local community should compete directly with child labor. On the other hand, we find that large-scale commercial noncocoa farming in the local community increases child labor on the family cocoa farm, probably because this type of external labor is remunerated and, in principle, offered to adults.

Children in this case thus seem to fill in for family adults on family cocoa farms.

It has been speculated that only truly desperate parents would have their children working on cocoa farms. This was not proven by our results. We only found that the biological children of the producer have a higher propensity to only school or to combine work (in cocoa farm) and school. This may make the case for reconsidering the driving forces behind cocoa child labor (including hazardous work): Ignorance about possible risks and dangers, combined with the possible educational value of working, could appear to be a much more better explanation than poverty or despair alone.

When focusing solely on child labor in cocoa farming, the context of this labor should not be forgotten (Basu, 1999). Simply sending the child away from work can sometimes be the worst response. The best solution will depend on the particular circumstances of the child and the family, considering factors such as the child's age, educational opportunities, family composition, and economic situation. For example, moving children away from cocoa into domestic services or subsistence farming may not only have welfare consequences very similar to work on cocoa farms, but may in addition have a much lower educational value.

Where educational opportunities exist, giving children time to attend school is a crucial consideration. Policies should be oriented toward children who are less likely to be enrolled in school. Results of this article indicate the target group to which efforts should be directed for a successful schooling policy. In the situations where educational facilities are poor or nonexistent, training or apprenticeship arrangements might have a better long-term effect.

In many cases, part of the reason why child labor and harmful child labor exist is that farmers do not recognize its potential for long-term damage. Work that is harmful to the health of a child or interferes with the child's education can have significant long-term effects on the development of both the child and ultimately society, by producing successive generations of adults who lack the basic skills needed for work in a modern economy. Adults who served as child laborers themselves often submit their own children to the same life pattern, leading to a kind of vicious cycle. There is no simple, or even a dominant way to approach the problem. Government agencies need not go alone. According to the World Bank (2001), some of the more successful initiatives against child labor have been the result of partnerships in which businesses have come together with communities, government agencies, NGOs, and international organizations to work toward a common objective.

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