Determinants of Child Labour and Schooling in the Native Cocoa Households of Côte d'Ivoire

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Abstract

Child labour is a widespread and growing phenomenon in the developing world. This paper looks at the determinants of child labour participation in the cocoa farming sector of Côte d'Ivoire, an issue of special interest because the country accounts for approximately 40% of the world's cocoa production. The study investigates child labour in conjunction with schooling status of children. It is based on a study done in 2002 that surveyed a representative sample of more than 11,000 members of cocoa households. A multinomial logit model was used to capture choice probabilities across work and school options.

The results reveal that child labour in cocoa farms and non-enrolment 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 labour is allocated. Econometric results generally indicated that the gender and age of children, whether or not the child is the biological child of the household head, parents' education, the household dependency ratio, the farm size, the cocoa productivity level, the number of sharecroppers working with the household head, agro-ecological zone and communities' characteristics are all pertinent in explaining the child work/schooling outcome.

Key words: Child labour, Cocoa, Multinomial logit, Côte d'Ivoire, Africa

1. Introduction

Child labour is a pervasive problem throughout the world, especially in developing countries. There is a growing concern that some agricultural goods in developed country markets are being produced under "exploitative" forms of labour practices. In particular, since 2001, there have been persistent reports that children are being used in cocoa production in Côte d'Ivoire. Allegations of child trafficking and abusive labour practices in meeting the labour demands of the country's cocoa production have been in the media spotlight and have become the focal point of national and international organizations.

The cocoa sector of Côte d'Ivoire is of particular interest for the country and for the global chocolate industry. In the course of the last 22 years, the sector has tripled in size and now accounts for over 40% of global cocoa production. Throughout the 1980s, the sector experienced an economic recession as world cocoa market went through a period of extremely low prices. The price received by farmers has often remained below US$0.50 per kg.[1] This situation led many households to implement risk-reducing strategies; farmers have been forced to cut costs by reducing expenditures and increasing the use of low cost labour including children.

The research problem

As the global movement against child labour on cocoa grows, the need for more precise and detailed analysis of child labour has become apparent. This will help to further improve awareness and understanding of child labour and reinforce efforts to eliminate it. According to the International Labour Organization (ILO/SIMPOC, 2002), of all the regions, sub-Saharan Africa has the highest child labour rate. The vast majority of these working children are unpaid family workers, involved in agricultural work, predominantly on farms operated by their families.

Addressing the thorny issue of child labour is vital to the development of many of Africa's youngest citizens, who will determine the future of sub-Saharan Africa: The child labour issue will be central in the fight against poverty.

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

The empirical fact that by far the majority of working children in cocoa sector work on household-run farms motivates a focus on modelling the peasant household.

Some authors argue that rural African societies do not consider child labour as a delinquent activity, and that the productive activity of a child living in a rural and traditional environment is a means of social integration and should be likened to teaching the child survival skills (Bekombo, 1981; Grootaert and Kanbur, 1995). This view does not see child labour in the 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 acquiring knowledge from the formal education system if we consider schooling as an investment in human capital that yields a return in the labour market. In that sense, it is natural to see schooling as the preferred alternative to child labour (Grootaert, 1998).

It is therefore important to understand the joint participation behaviour of the household in their decision of whether to send a child to school and/or to work. This understanding could help to formulate more appropriate education and labour policies to remove obstacles to one of the most important long term objectives of any poverty-conscious economy: the training of tomorrow human resources.

Several studies have examined the determinants of child labour and schooling in rural Africa (Andvig, 2001). Many such studies focused on child labour participation in economic activities in general, and did not permit the understanding of the specificity of the issue in some major sectors. This study fills the gap by investigating the child labour participation in the particular sector of cocoa in Côte d'Ivoire. The study attempts to identify certain key factors governing child labour and schooling in the cocoa sector.

The paper is divided into six sections. Section 2 presents research objectives and Section 3 summarizes the literature review. Survey methods and data sources are described in Section 4. Section 5 presents the econometric model used in this study; Section 6 presents the empirical model specification; and Section 7 discusses results. The paper ends with conclusions and some policy lessons for eliminating exploitative child labour in cocoa farming and ensuring higher participation in schools.

Objectives

The main objective of this study is to investigate the child labour phenomenon in the cocoa sector of Côte d'Ivoire in conjunction with school participation. The specific objectives are to:

- Determine the extent and incidence of child labour and its worst forms in cocoa production.
- Review legislation on child labour.
- Establish the characteristics of the families of working children.
- Determine the factors affecting child labour participation and schooling in the cocoa sector of Côte d'Ivoire.

2. Literature review

According to the ILO, a child is defined as an individual under the age of 18 years. Since it is commonly accepted that a child under five years of age is too young to be engaged in work (although there are some cases of exploitation or abuse by adults), or to start schooling, the child labour concept usually considers only the child population aged 5–17 (ILO/SIMPOC, 2002).

Child labour is, for obvious reasons, particularly widespread in developing countries, and more so in rural than in urban areas. Child labour is most concentrated in Asia and Africa, which together account for more than 90% of total child employment. Although there are more child workers in Asia than anywhere else, a higher percentage of African children participate in the labour force (Siddiqi and Patrinos, 1995; Fluitman, 2001). The vast majority of these working children are unpaid family workers, involved in agricultural work, predominantly on farms operated by their families (Bhalotra and Heady. 2003; Iversen, 2000). Children in developing countries also contribute more time to a household than they deplete as compared with their counterparts in developed countries (Lindert, 1976).

Empirical studies in developing countries reveal that children contribute as much as one-third of household income at times and their income source cannot be treated as insignificant by poor families (Patrinos and Psacharopoulos, 1994). Evidence suggests that some parents decide to have children on the basis of a cost-benefit perspective (Singh and Schuh, 1986). Children in sub-Saharan Africa tend to be of economic value and, as a result, become a desirable asset for struggling parents.

A recent study by Bhalotra and Heady (2001), however, challenged the common presumption that child labour emerges from the poorest households. The authors suggest that this seeming wealth paradox can be explained by failures of the markets for principally labour and land. Because African rural societies do not regard child labour as a delinquent activity, the problem becomes then, not child labour itself, but the conditions under which it operates (Boyden, 1991).

The literature on child labour is limited, scattered and tends to come from outside the economic discipline with an emphasis (if any data are used at all) on case studies, on legislation or on surveys that are limited in their geographical and behavioural coverage.

One survey of research on child labour in sub-Saharan Africa (Andvig, 2001) concludes that very little research addresses children's work directly. This is true even in social anthropology, a field that has studied African communities systematically for more than 70 years (Andvig et al., 2001). Nevertheless, valuable empirical research has been taking place over the years. According to Andvig, there are basically two different

sources of information. Some studies are based on large household surveys, mostly analysed by economists and demographers; others are from scattered anthropological work, often based on information gained through participatory observation. Most of the exploration of child labour based on household surveys is fairly recent, while most of the anthropological work dates to the 1970s and 1980s.

Several empirical studies have examined the determinants of child labour and schooling in rural Africa (Andvig, 2001). Amongst the recent empirical studies focusing on child labour in sub-Saharan Africa – and often on schooling attendance as well – we can cite

Canagarajah and Coulombe (1998), Grootaert (1998), and Coulombe (1998). These empirical works, consisting of case studies in Ghana and Côte d'Ivoire, make use of large-scale representative household surveys that have the advantage of providing information about children who do and do not work, thereby making it possible to investigate the decision to work.

According to Coulombe (1998) any stylized facts cannot be drawn from the empirical literature on child labour. This author argues that a series of methodological problems make such stylized facts hard to come by. First, the few empirical studies were done in very different countries, at least in terms of development levels and hence of economic opportunities. Second, various questionnaire designs may have caused different interpretations of what "work" means. Third, the definition of a working child varied. Some studies included unpaid family work or housekeeping activities while others did not. And finally, studies tended to focus on either rural or urban samples only.

Nevertheless, some relatively common findings seem to emerge from this limited empirical literature:

- Welfare levels of households are negatively related to child labour market participation likelihood, but the effect tends to be very low. School attendance by a child is also highly correlated with family income (Ilon and Moock, 1991).
- Boys have a higher participation rate in the labour market (paid or unpaid), but girls are more likely to participate in housekeeping.
- Parents' education is negatively related to the probability of working. Parents who are educated understand the importance of schooling from personal experience. As a result, parental education plays a large role in determining child schooling and employment (Tienda, 1979).
- Age/gender household composition matters.
- Traditional factors such as rigid cultural and social roles in certain countries further limit educational attainment and increase child labour (Siddiqi and Patrinos, 1995).
- An analysis of the effect of children's work on learning achievement, using measures of skills learned in reading and mathematics, finds that work outside the household has a substantial effect on learning achievement (Heady, 2003).

In summary, previous studies in sub-Saharan Africa suggest that labour/school participation is influenced by various child, parent and households characteristics. Early studies focused on child labour participation in economic activities in general, and thus did not illuminate the issue in some major sectors. Our proposed study focuses on the cocoa sector in Côte d'Ivoire.

3. Survey and data

Data on child labour are still very scarce. This is especially true for some of the worst and often hidden forms of child labour (ILO/SIMPOC, 2002). In order to obtain information on the state of abusive forms of child labour in the cocoa sector in Côte d'Ivoire, an extensive national survey was conducted in 2002. This survey was the first effort towards building a knowledge base on the cocoa producing household and its workforce.

A list of producers obtained from a 1998 national census of cocoa and coffee producers made it possible to select households with known probability of selection. 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.[2] 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. The survey collected detailed information on more than 11,000 household members.

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 remaining 8,289 (70.8%) were other family members.[3] Among the "other family members", 5,263 (45.1%) were biological children of the head of the household, while 2,622 (22.5%) were extended family and 384 (3.3%) were members having no family ties to the household head (Table 1).

These data were complemented by other primary and secondary data from specialized institutions, particularly the ILO. To avoid having to model the effects of migration, when analysing the determinants of child labour, the investigation is restricted to children of native families (non-migrants).

Table 1: Frequency and percentage of household members by category

Category	Frequency	Percentage (%)
Household head	1,490	12.8
Spouse	1,910	16.4
Family 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**

4. Conceptual model

Cocoa farmers in Côte d'Ivoire must decide whether to send a child to school or to work on the cocoa farm. There are several ways to model child labour and schooling econometrically. Contemporary labour economics employs theories of choice to analyse and predict the behaviour of labour market participants (McConnell and Brue, 1989). In this study, we attempt to answer questions such as: Why do some prospective child labour participants choose to delay their entry into the labour force in order to attend school? Why do some parents decide to employ their children on cocoa farms while others do not? Why do some children combine work and school?

Economists investigating choice decisions have accumulated considerable evidence showing that the observed choice decision on a technology or a behaviour is the end result of a complex set of inter-technological preference comparisons made by farmers. Yet despite all the development in decision theories by anthropologists, sociologists and philosophers, today's farmers still rely largely 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 adoptions (Kebede et al., 1990; Polson and Spencer, 1991; Nkamleu and Adesina, 2000). Several empirical studies have tried to identify the influence of socioeconomic variables on child labour and schooling. In most cases, probit, logit or bivariate probit model is applied (Canagarajah and Coulombe, 1997; Grootaert, 1998; Andvig, 2001). In these models, the farmer's decision is assumed to be of a dichotomous nature.

A multinomial logit model (Madalla, 1983; Cramer, 1991; Nkamleu and Coulibaly, 2000) 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. Apart from the well-known drawbacks of the Independence of Irrelevant Alternatives (IIA), this approach is more appropriate than the probit or logit models that have been conventionally used.

Instead of having two dichotomous alternatives (0, 1) as in the multivariate logit or probit models, the multinomial logit has S possible states or categories – that is $s = 1, 2, 3..., S.$ – that are exclusive and exhaustive (Cramer, 1991). In this analysis, the four categories considered are:

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 (Amemiya, 1981). If there is a random sample of farmers, *i=1,2,3...,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:

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

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

The parameters β_i are estimated using LIMDEP©. An iterative maximum likelihood algorithm will be used to estimate the empirical models in order to obtain asymptotically efficient parameter estimates (Greene, 1992).

The log-likelihood function for the multinomial logit model is (Greene, 1992: 484):

$$\ln L = \Sigma_i \Sigma_j d_{ij} In P_{ij}$$

where P_{ij} is the probability of individual *i* in state '*j*'. $d_{ij} = 1$ *if* $y_i = j$, 0 otherwise, $j = 0,..., J$

The first derivative are: $\partial InL / \partial \beta_j = \Sigma_i (d_{ij} - P_{ij}) X_{i\cdot}$

The Hessian is $\partial^2 InL / \partial \beta_i \beta_m^{'} = -[1(1 = m) P_1 - P_1 P_m] X^{'} X$

Although the 1989 UN Convention on the Rights of the Child defines children as all individuals under the age of 18, child labour literature so far tends to concentrate on the 6–14 year age group. 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 6 have generally been considered to be too young to participate substantially in the labour force. A look at the decision on child labour and schooling indicates that it would also make little sense to include 15–17-year-olds who are beyond compulsory school age and are very rarely in school in the areas studied. Therefore, in the modelling part of this study, we will only use the 6–14 age group in the econometric model.

5. Empirical model

Variables used in the estimation are presented in this section. Previous studies in sub-Saharan Africa suggest that labour participation is influenced by different child, parent and household characteristics. Consequently, these factors are assumed to be important determinants of work/school participation. A total of 21 independent variables has been included in the empirical model. The descriptive statistics of variables are given in Table 2. The discussion and justification of the independent variables included in the model are provided below.

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

Variable	Description	Mean	Std. dev	Mini-mum	Maxi-mum	No. of cases
Child characteristics						
SEXCHILD	Gender dummy of the child: 1=male; 0=female	0.57	0.50	0	1	1,568
AGECHILD	Age of the child in years	9.55	2.51	6	14	1,571
BIOCHILD	Dummy for child being the biological child of household head: 1=yes ; 0=no	0.68	0.47	0	1	1,571
Parent characteristics						
COCOAEXP	Producer's cocoa farming experience in years	21.23	12.02	1	69	1,548
AGEP	Age of the producer	53.54	15.12	20	110	1,560
HOUSEHOLD HEAD'S EDUCATION LEVEL (Producer's educational attainment)						
No education	No formal education (0/1)	0.42	0.49	0	1	1,563
Primary (1-6 years)	Primary school (0/1)	0.40	0.49	0	1	1,563
Secondary1 (7-10 years)	Secondary1 (0/1)	0.15	0.36	0	1	1,563
Post secondary1 (11 years and +)	Post secondary1 (0/1)	0.03	0.15	0	1	1,563
Household characteristics						
HQUALITY (Index composed by standard quality of wall and roof material.)						
Low quality	Low house quality (0/1)	0.23	0.42	0	1	1,571
Medium quality	Medium house quality (0/1)	0.39	0.49	0	1	1,571
High quality	High house quality (0/1)	0.38	0.49	0	1	1,571
HHSIZE	Number of household members	9.74	3.96	2	21	1,409
DEPRATIO	Share of household members <6 and >55 (%)	0.22	0.14	0	0.67	1,438

continued next page

Table 2 Continued

Variable	Description	Mean	Std. dev	Mini-mum	Maxi-mum	No. of cases
Farm characteristics						
COCOAPRO	Productive cocoa farm size (ha)	3.63	4.00	0	45	1,557
AREAFOOD	Food crop farm size (ha)	4.73	12.82	0	150	1,419
AREAOTPE	Other perennial crop farm size (ha)	7.09	14.61	0	152	1,551
YIELDCL	Yield per hectare: 1=Low; 2=Medium; 3=High	1.99	0.81	1	3	1,426
NSHACROP	Number of sharecropper working with household head	0.59	1.02	0	6	1,571
Community characteristics						
SPCOAREA	Average size of cocoa farms within region (ha)	3.45	1.23	1.75	9	1,571
SPAREANC	Average size of non-cocoa farms within region (ha)	5.24	2.89	1.37	17.5	1,571
SPYIELDC	Average productivity class of cocoa in the region	1.76	0.34	0.86	2.8	1,571
SPHHQUAL	Average housing standard in region	0.99	0.31	0.31	1.6	1,571
WEST	Dummy variable for Western region: 1=west, 0 = otherwise	0.11	0.31	0	1	1,571
EAST	Dummy variable for Eastern region: 1=east, 0 = otherwise	0.25	0.43	0	1	1,571
CTWEST	Dummy variable for Centre-West region: 1=Centre-West, 0 = otherwise	0.47	0.50	0	1	1,571

Child characteristics

In this category, *SEXCHILD* indexes the gender of the child (0=female, 1=male). Some authors have emphasized that boys were more likely to be involved in the labour market while girls are more likely to do more housekeeping work (Psacharopoulos and Arriagada, 1989; Patrinos and Psacharopoulos, 1994). A recent study by Canagarajah and Couloumbe (1998) in Ghana came out with gender discrimination, with boys having greater likelihood of going to school compared with girls. We expected *SEXCHILD* to be positively related to both *WORK* and *SCHOOL*.

AGECHILD 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 more enrolled in school. We hypothesized *AGECHILD* to be positively related to WORK and also positively related to *SCHOOL*. The model includes a quadratic in child age to determine any non-linearity in the relationship.

BIOCHILD is a dummy variable equal to one if the child is a biological child of the household head, and zero otherwise. Kinship fostering or guardianship of orphans and non-orphans is a common practice in Africa (Case et al., 2002). However, inheritance laws favour biological son/daughter 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 the cocoa farm in preparation for inheritance.

A phenomenon discussed in the child labour literature is the impact of family ties on school enrolment (Case et al., 2002). Children who are cared for by adults other than their biological parents have been found to be disadvantaged. We therefore hypothesized a positive relationship between *BIOCHILD* and both *WORK* and *SCHOOL*.

Parent characteristics

First among these variables is *COCOAEXP,* which measures the number of years of cocoa farming experience of the household head. It is expected that farmers with experience will be able to better assess the hidden wealth of cocoa farming. Grootaert and Kanbur (1995) argued that child labour is perceived as a process of socialization in many African countries. Experienced farmers therefore believe that working as well as formal education enable a child to get acquainted with the necessary skills required for a better future. We hypothesized that the more experienced the household head, the more it is likely that the child will combine *WORK* and *SCHOOL*.

AGEP is age of the household head. Older farmers are tired, and are near or already in retirement. Hence, they have less land to manage and will need less child labour than younger farmers. Also, the perceived low return of education will make education less attractive for older parents. It is hypothesized that *AGEP* is negatively related to *WORK* and negatively related to *SCHOOL*.

EDUCP measures the level of education of the household head. This variable is broken into four dichotomous variables (1 = no formal education: 2 = primary school: 3 = secondary1; 4 = post secondary1). The effect of education on child labour has been intensely debated. Empirical studies have shown that the level of education negatively affects the likelihood of child working (Coulombe, 1998; Canagarah and Coulombe, 1997). It is hypothesized that *EDUCP* is negatively related to *WORK* and positively related to *SCHOOL*.

Household characteristics

The variable measuring house quality of the main household building, *HQUALITY*, is a quite well regarded proxy for welfare in rural Africa, where information on income and consumption can be difficult to obtain and to assess in a reliable way. This variable is represented by three dichotomous variables. Houses with mud walls and straw roofs are 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 having iron sheet or other solid roofs are given the highest wealth score (=2).

FHHSIZE is the household family size. Generally, large households have more problems to resolve (sickness, etc.), which leave them with little capital to send all the children to school. Also, a large family may have more labour availability and hence other members are able to take care of the cocoa farm, preventing children from work. It is hypothesized

that *FHHSIZE* is negatively related to *WORK* and to *SCHOOL*. The square of "family size" is included to determine any non-linearity in the relationship.

DEPRATIO is the dependency ratio representing the share of household members under 6 years of age and over 55 years. Caring for young siblings and serving the elderly increases demand for housework substantially, reducing both work in cocoa farms and school enrolment. For Ghana, Bhalotra and Heady (2001) find that the share of children under 6 in the household strongly increases housework child labour. We expected a negative relationship between *DEPRATIO* and both *WORK* and *SCHOOL*.

Farm characteristics

As farm size increases, farmers need more labour inputs (Kebede, et al., 1990). Increase in farm size is likely to increase the use of child labour and decrease schooling. *COCOAPROD* is used as the measure of cocoa land size in ha. We hypothesized that *COCOAPROD* is positively related *WORK* and negatively related to *SCHOOL*.

AREAFOOD and *AREAOTPE* are, respectively, the food crop farm sizes and other perennial crop farm sizes. Farmers with large non-cocoa land resources, other things being constant, will need more labour to take care of these lands and therefore lower participation on cocoa farms and enrolment in school. We expected *AREAFOOD* and *AREAOTPE* to be negatively related to both *WORK* and *SCHOOL*.

YIELDCL represents the level of cocoa productivity. Farmers are divided into three equal cocoa productivity classes (tercile), coded 1 = Low; 2 = Average; and 3 = High. In cocoa production systems, there is a high correlation between productivity and use of chemical inputs. Farmers having high productivity are those using chemical inputs particularly fungicides and fertilizers, which are labour demanding inputs. 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 *YIELDCL* is positively related to both *WORK* and *SCHOOL*.

NSHARECROP 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 labour by making the labour of the tenant's family available, in addition to the labour of the tenant (Basu, 1997), hence enabling the landlord's school aged children not to work and to go to school. It is hypothesized that *NSHARECROP* is negatively related to *WORK* and positively related to *SCHOOL*.

Community characteristics

The first two variables in this category are *SPCOAREA* and *SPAREANC*, respectively denoting the average size of cocoa farms in the sample cluster (the s*ous-prefecture* or commune) and the average size of other perennial crops (non-cocoa) farms in the region. It is expected that the more farmlands there are in the area, the higher the community farm labour demand. If there is a high demand for labour on community farms, we have to assume that this labour is primarily remunerated, and thus will primarily

pull adult labour rather than child labour. We should in this case expect that children would fill in for adults on the household cocoa farm, and thus hypothesize a positive relationship between our proxy for external farm work demand (community average farm size) and child labour. We expect *SPYIELDC* (average productivity class of cocoa in the cluster) to be negatively related to child work and schooling, since a high return of cocoa work in external cocoa farm is susceptible to pull child labour.

SPHHQUAL represents the average house quality in the cluster (*sous-prefecture* or commune). This is a good proxy of community wealth. Wealthier communities are better off in terms of apprenticeship opportunities as well as remunerated domestic services, which can pull children away from farming activities.

WEST, EAST and *CENTRE-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 non-farming activities, or the quantity, quality and distribution of school infrastructure. The regional factor will normally have an impact on the pattern and intensity of child labour and school attendance.

Past studies acknowledge the particular risk of endogeneity related to certain core independent variables when examining issues like child labour. Most prominently, a household income assessment may be endogenous as children often contribute to the household income level through their labour.

In this analysis the potential endogeneity problem of household wealth is reduced by the fact that we examine child labour delivered to only *one* of the potential labour markets available to the household members. Moreover, we assume that the *house quality* wealth proxy is potentially less risky than the direct assessment of income or consumption. With regard to productive land size, cocoa farming is less flexible than most other farming, in the sense that it takes approximately seven years to obtain productive cocoa trees. Cocoa farming is therefore not very suitable for flexible adjustment based on what labour might be available at any given time. There is, besides, a significant scarcity of cocoa farmland in the areas studied, something that would further complicate such adjustments of landholdings based on child labour availability.

Cocoa productivity class *(YIELDCL)* is of a much more central concern as it could potentially bear a high risk of being endogenously related to child labour 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 ordinary least squares (OLS) regression of the productivity variable on a series of exogenous variables. Second, we substitute the *YIELDCL* variable by the predicted *YIELDCL* from the first regression as regressors in our multinomial logit regression.[4]

6. Results

So as to put the presentation of the results of the model in perspective, it is useful to briefly review the various aspects and activities involved in the cocoa farming and production process. With this background we can then get into the details of the field survey and the econometric model results.

The cocoa farming process

The labour intensity of the cocoa farm, and subsequently the labour input, fluctuates over the year with the main peek season during harvest time in September and October. The labour demand relates to around a certain number of major tasks that in this study are organized in 11 categories.

- ***Weeding.*** This task is typically undertaken twice a year, first in May/June and again prior to the harvesting season in September/October. This activity implies the use of 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, moreover, must be considered as extremely heavy work.
- ***Field preparation:*** After weeding, the cocoa farm needs to be cleared of the weeds cut during the weeding process, which generally involves carrying the dry weed off the field.
- ***Farm upkeep:*** Farmers will sporadically trim the cocoa shoots and regulate the shade canopy. They will also – usually in conjunction with the other labour tasks – conduct phyto-sanitary harvest, which consists of removing diseased pods from the tree and the farm.
- ***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 and protective equipment and thorough training is required in order not to harm those applying it. Children are likely to handle these substances with less caution and are at a higher risk of developmental harm than adult labourers.
- ***Harvest:*** Once the pods are ripened, the most labour intensive season on the cocoa farm begins. The ripe cocoa pods are cut down from the trees, again using a machete. The task requires some experience to be able to distinguish ripe pods from unripe pods.

- ***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 as one of the most heavy on the farm.
- ***Pod breaking:*** At the site of collection the cocoa pods are broken open and the wet beans separated from the mucilage of the pod prior to fermentation. While the cutting open of the pod involves the use of a machete, much of this process does not. Many hands – in particular children – would primarily be employed in extracting the wet cocoa beans from the opened pod.
- ***Transport:*** After the wet beans have been separated from the pods, they are transported to the place where they will ferment and dry. In most cases this transport goes from the cocoa farm to the farmers' concession in the village. While the distance may be short, for example for farms located in the forest zone, it can also be very long, particularly when the farmer lives in more urbanized village areas. We must again assume that this is one of the heaviest tasks of the farming process.
- ***Fermentation:*** After the cocoa beans are extracted they are fermented for 4–7 days depending on the producer. The process involves mixing the beans every 48 hours, and beyond that, guarding the beans requires labour input as theft of cocoa beans is not uncommon.
- ***Drying:*** Once the cocoa is finished fermenting it is dried in the sun or in ovens. Again the beans need to be guarded as well as handled throughout the drying process.

Field survey results

Children's involvement in cocoa farming activities is summarized in Table 3. It is estimated that 50.8% of children aged 6–17 are employed by their parents on cocoa farms. This figure is considerably higher for the 15–17 age group (74.3%), and relatively low for the 6–14 age group (45.7%).

Looking at the relationship between family child labour on a task-by-task basis, we find a significantly greater mobilization of this labour type for cocoa pod collection, cocoa pod breaking and field transportation. Respectively, 32.8%, 21.3% and 14.1% of the sensitive 6–14 age group are employed for such tasks.

One of the major concerns about child work is the health and safety threat posed by some tasks. Up to 5.5% of children are employed for weeding of cocoa plantations. Another dangerous task is pesticide application. The children employed in this task may be exposed to inappropriate health risks associated with the mixing of pesticide. Although only 1% of the children performed pesticide application, when adding the 9% of children involved in all tasks, it appears that child labour in hazardous jobs is considerable. Other potentially risky tasks include transporting excessively heavy loads, and cocoa pod opening when done using a machete.

It is important to note that 5.3% of children ages 6–14 and 25.7% in the 15–17 age group are involved in all tasks on cocoa farms. Thus there is significant use of family child labour, which can be considered as a major factor of production.

Table 3: Percentages of family child labour participation by task and age group in the cocoa sector of Côte d'Ivoire

Task	Children 6-14 years (n=1571)	Children 15-17 years (n=342)	Children 6-17 years (n=1913)	Classification of the task
Weeding	4.4	10.4	5.5	Hazardous work [a]
Field preparation	1.4	1.8	1.4	Light work [b]
Farm upkeep	3.6	5.4	3.9	Light work
Pesticide application	1	1.2	1	Hazardous work
Fertilizer application	0.1	0.0	0.1	Hazardous work
Harvesting cocoa pods	5.3	8.1	5.8	Light work
Cocoa pod collection	32.8	39.4	34	Light work
Cocoa pod breaking	21.3	34.3	23.7	Light work (if not involving use of machete
Field transport	14.1	22.1	15.5	Light work (if not heavy loads)
Fermentation	3.6	7.5	4.3	Light work
Drying	6.1	9.3	6.7	Light work
All activities	5.3	25.7	9	Hazardous work
Other activities	0.6	0.6	0.6	-
Participation in at least one task	45.7	74.3	50.8	-

[a] Following the ILO definition, hazardous work by children is any activity or occupation that by its nature or type has, or leads to, adverse effects on the child's safety, health (physical or mental) and moral development.
[b] Light work is work that is not hazardous in nature (may be regarded as positive). It is important to note, however, that none of the light works are unconditional – under certain conditions, a light work could become a worst form of child labour.

One of the concerns often raised over the issue of working children is whether they are enrolled in school. The question become whether or not working in the cocoa farm means the child is unable to attend 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 4 shows the distribution of children (6–14 years) across the four categories by region and gender of child. The survey data show that first, 42.7% of children attend school as their only activity. Second, 34.7% of children combine schooling and work on cocoa farms. Third, 11.1% of children work on cocoa farms as their sole activity. Fourth, 11.4% are reportedly not schooling or working.

It is also obvious that non-enrolment in school is much higher in the Southwest and Western regions, where 69.2% (44.2+25) and 62.6% (36.8+25.8) of children, respectively, have been reported as attending school. The proportion is greater than 75% in other regions. At the same time, we observe that relatively more children in the South and West fell within the "work only" category. In Southwest 16.2% of children do not attend school and work on cocoa farms; the share is 19.6% in West.

The survey data also shows a distinct gender dimension. In all regions, girls' school enrolment is lower than that of boys. In general, 80.9% (43.5+37.4) of boys are enrolled in school against 73% (41.8+31.2) of girls. However, slightly more boys are employed on cocoa farms than girls (46.6% against 45% for girls). Also, relatively more girls are in

the category of "no school and no work". The reason could be that girls are generally more engaged in home chores and work on food crop fields.

Table 4: Activity status of children (6–14 years) by region and gender (%)

Activity		Southwest (n=260)	Centre-West (n=729)	East (n=386)	West (n=163)	All (n=1535)
School only	Boys	46.3	44.3	42	39.4	43.5
	Girls	42.1	40.5	47.3	33.3	41.8
	All	44.2	42.8	44.6	36.8	42.7
School and work in cocoa farm	Boys	26.1	43.1	38.4	25.7	37.4
	Girls	23.8	40.2	22.4	26.1	31.2
	All	25	41.8	31.3	25.8	34.7
Work in cocoa farm only	Boys	14.2	6.6	7.8	17	9.2
	Girls	18.3	9.6	13.9	23.2	13.8
	All	16.2	7.8	10.4	19.6	11.1
No school and no work	Boys	13.4	6.1	11.9	18.1	10
	Girls	15.9	9.6	16.4	17.4	13.3
	All	14.6	7.5	13.7	17.8	11.4
Total		**16.9**	**47.4**	**25.1**	**10.6**	**100**

Econometric model results

Results from the model for work/school are presented in Table 5. The first step OLS results are presented in Table A1 in Appendix A. Using multinomial logit specification with 1,101 observations, a maximum likelihood procedure was used to estimate the parameters. Percentages of correct predictions for each category are given in Table 6. 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 exogeneity test. The null hypothesis of the exogeneity of productivity variable was rejected. As a whole, 12 of the 21 variables included in the model had significant effect in explaining work and/or school decisions.

Table 5: Multinomial logit model of work/school choice in the cocoa sector of Côte d'Ivoire

Variables	Child status					
	Work only		School only		Work and school	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	-15.107	-3.71 ***	-10.142	-3.18 ***	-18.881	-5.47 ***
SEXCHILD	-0.124	-0.41	0.398	1.68 *	0.683	2.70 ***
AGECHILD	2.279	4.03 ***	2.164	4.97 ***	3.460	7.28 ***
AGECHSQ	-0.095	-3.38 ***	-0.105	-4.71 ***	-0.156	-6.49 ***
BIOCHILD	0.125	0.32	0.282	0.92	0.396	1.22
COCOAEXP	0.004	0.23	-0.009	-0.66	0.017	1.18
AGEP	0.019	0.89	0.012	0.74	0.014	0.79

continued next page

Table 5 Continued

Variables	Child status					
	Work only		School only		Work and school	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Household head's education level						
Primary (1-6 years)	-0.815	-2.14 **	0.027	0.09	-0.122	-0.39
Secondary1 (7-9 years)	-0.862	-1.55	-0.276	-0.61	0.175	0.38
Post secondary1 (10 years and +)	-1.144	-1.21	-0.796	-1.12	-1.159	-1.50
HQUALITY						
Medium quality	-0.273	-0.62	-0.449	-1.30	-0.112	-0.31
High quality	-0.271	-0.64	0.032	0.10	-0.146	-0.40
HHSIZE	0.122	0.57	0.145	0.86	-0.011	-0.06
HHSIZSQ	-0.010	-1.02	-0.008	-1.02	-0.003	-0.32
DEPRATIO	-2.165	-1.81 *	-1.662	-1.76 *	-2.983	-2.98 ***
CACAOPRO	0.086	1.41	-0.009	-0.19	-0.005	-0.10
AREAFOOD	0.0002	0.02	0.004	0.35	-0.002	-0.19
AREAOTPE	-0.053	-1.81 *	-0.020	-0.93	-0.064	-2.50 ***
YIELDCL (predicted)	2.394	1.77 *	-0.011	-0.01	0.863	0.75
NSHACROP	-0.483	-2.32 **	-0.084	-0.53	-0.325	-1.87 *
SPCOAREA	0.311	1.61 *	0.143	0.91	0.189	1.14
SPYIELDC	-1.980	-1.52	-0.210	-0.20	-0.484	-0.44
SPAREANC	0.159	1.95 **	0.055	0.77	0.164	2.25 **
SPHHQUAL	-0.313	-0.45	-0.166	-0.30	-0.585	-1.02
WEST	-0.202	-0.26	-0.682	-1.09	-0.572	-0.85
EAST	-0.057	-0.07	0.567	0.95	0.613	0.96
CTWEST	0.158	0.25	1.056	2.19 **	1.137	2.18 ***

X-(54) = 388.71*****;** Percentage of correct predictions of child utilization categories = 54%; log-Likelihood function = -1133.94; Sample = 1,101

*** significant at 0.01; ** significant at 0.05; * significant at 0.10.

Table 6: Percentages of prediction for each child use categories

Category		Predicted				Total (n)
		None	Work only	School only	School and work	
Actual	None	15.5%	1.5%	64.5%	18.5%	115
	Work only	1.5%	14%	29.5%	55%	116
	School only	3.5%	2%	62%	32.5%	449
	School and work	1%	1.5%	30.5%	67%	421
	Total (n)	**38**	**34**	**516**	**513**	**1,101**

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 15.5% (18/115). The row total should be equal to 100%.

Child characteristics

In the model, there are three variables directly characterizing the child: gender, age and relationship to the household head. *SEXCHILD* is positively and significantly related to "school only" and "work and school" alternatives, suggesting that the probability of going to school alone and combining school and work is higher for boys. This result corroborates findings by Canagarajah and Couloumbe (1998) in Ghana.

AGECHILD is significant with expected signs in all choice categories. As expected, the older the child, the more it is likely that they 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 non-linear way. The effect of *AGECHILD* on dependent variables declines at higher levels of *AGE*.

Parent characteristics

Some parent characteristics are also relevant in explaining child labour and school decision, most specifically farmer education *(EDUCP)*. This had a positive effect on child schooling as the only alternative, suggesting that educated farmers have a better knowledge of the negative effect of working without schooling.

Household and farm characteristics

The dependency ratio *(DEPRATIO)* negatively affects all categories. Thus the higher the dependency ratio, the lower the likelihood of children opting to work or attend school.

The size of other perennial crop farms *(AREAOTPE)* is negatively related to work only and the work and school combination. Farmers with large non-cocoa land resources, other factors remaining constant, use supplementary labour to care for these lands and therefore lower involvement on cocoa farm and enrolment in school.

Yield class *(YIELDCL)* is positively related to work only, suggesting farmers with high productivity have a greater probability of using child labour. High productivity, which implies high return for labour inputs, seems to encourage child labour utilization. The number of sharecroppers working with the household head *(NSHARECROP)* is significant and negatively related to work and school combination. This suggests that the presence of sharecroppers will lower the probability of children already in school to also work.

Community characteristics

With regard to other perennial crop farm size in the community, work only and combine school and work are both positive and significant. This confirms that high community labour demand puts a strain on the availability of external labour, and that children therefore would be the most likely to replace family adults working on other farms.

In the same manner, as expected, average productivity of cocoa in the cluster *(SPYIELDC)* is negatively related to child work. The higher the cocoa yield per ha in the community, the lower the child labour in household cocoa farms. High productivity will increase the marginal return in child labour in the community. Attracted by high salaries, children will be pulled away from household cocoa farms, and there will be a turn toward non-household cocoa farms.

Finally, regional variables show that children from the Centre-West region are more likely to be enrolled in school only, and are also more likely to combine school and work. Thus, Centre-West is the most privileged region.

In order to see whether these findings are robust and whether there are any nuances to the observations made, we estimate the model in different sub-samples. The analysis was broken down by sex to examine gender aspects of some of the determinants and hypotheses discussed (Tables A2 and A3). The subsample estimates confirm the overall results for robustness of the estimates, although some additional differences could be observed. In particular, community variables seem to be more important in the female subsample.

In a multinomial logit model, the coefficients are estimated according to each outcome category. In all the models estimated here, the basis category is "neither". The estimate coefficients indicate the independent log odds or chances of an independent variable being in the dependent variable category of interest, versus being in the base (or contrast) category of the dependent variable. If there is no relationship, the coefficient will be zero. Negative coefficients indicate a negative association or negative chances or odds of being in the dependent variable category of interest and positive coefficients indicate positive chances.

The multinomial logit does not share the monotonic behaviour 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: 478) and Cramer (1991: 46–7), the marginal effects depend on the point of evaluation. Moreover, owing to the non-monotonic nature, the marginal effect can vary in sign according to the value of the dependent variable (The estimate coefficients of the marginal effects indicate the change in probability of being in the dependent variable category of interest, versus being elsewhere). Thus, the intuition behind the coefficients of the marginal effects in the multinomial logit model is different from the one behind the coefficients of the model.

To give an overview of the size of effects, the marginal effects or predicted probabilities (that is change in predicted probabilities associated with changes in the explanatory variables) are developed on the basis of the multinomial logit model of being in each of the four categories or outcomes. The marginal effects coefficients evaluated at the mean and presented in Appendix Table A4 confirm many of our findings. But globally, as expected, for many variables the marginal effects coefficients do not have the same sign as model coefficient, since the stories behind the marginal effects coefficient are different.

7. Conclusions and policy implications

Child labour 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. Yet obscured from the public eye is the reality that the vast majority of working children in the cocoa sector are predominantly family-controlled child labour.

Using data from a 2002 survey of a sample of more than 1,500 cocoa households, this study applied a multinomial logit model to identify the factors that affect farmers' decisions across different categories of child utilization. The main objective was to identify variables that can help design an array of usable policy instruments for the promotion of the good development of children.

Survey data reveal that 50.8% of children between ages 6 and 17 are employed by their parents on cocoa farms. The figure is higher for the 15–17 age group (74.3%). On a task-by-task basis we find a significantly greater mobilization of this labour 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 pesticide application and weeding.

With children (ages 6–14 years) classified into four mutually exclusive categories according to their work/schooling status, the data collected reveal that 42.7% of children attend school and are not working on cocoa farms; 34.7% combine schooling and work on cocoa farms; and 11% work on cocoa farms as their sole activity. Finally, 11.4% are reported as not schooling and not working. These findings suggest that child labour in cocoa farming as well as non-enrolment in school are important.

The econometric analysis highlighted the effect of socioeconomic factors on child labour and schooling. Results generally indicated that:

- The children who are more likely to work on cocoa farms and not attend school (work only) are older children, children from non-educated parent, children living in a household with relatively lower number of dependents, children from households with lower non-cocoa perennial tree land, children from households with high cocoa productivity, children living in households employing a lower number of sharecroppers, children living in communities with low average cocoa productivity, children living in communities with higher average non-cocoa land.
- Boys, older children, children living in households with a relatively lower number of dependents, and children living in Centre-West region are more likely to be going to school and not working on cocoa farms (school only).
- The children who are more likely to be combining school and work on cocoa farms (school and work) are boys, older children, those living in households with relatively

lower numbers of dependents, children from households with lower non-cocoa perennial tree land, children living in households employing a lower number of sharecroppers, children living in areas with higher non-cocoa land, children living in Centre-West region.

These findings have important implications for current efforts to reduce child labour participation in export cocoa farming. While the main current initiatives focus on – and need to continue focusing 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 labour in non-farm activities. In such a case, non-farm sectors will attract both children actually working on cocoa farms and children in schools. Thus solving the cocoa child labour problem may result in a new problem if no parallel interventions aiming to prevent such side effects are simultaneously implemented.

This study 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 also noticed how children are kept out of both farming and schooling in more productive communities. We suggest that high remuneration opportunities as well as remunerated domestic services in better-off households in the local community would compete directly with child labour on family cocoa farms. On the other hand, we found out that large-scale commercial non-cocoa farming in the local community increases child labour on the family cocoa farm, probably because this type of external labour 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 did not find a significant propensity of biological children of the producer to work or to combine work and school. This may make the case for reconsidering the driving forces behind cocoa child labour: Ignorance about possible risks and dangers, combined with the assumed educational value of working, may be much better explanations than poverty or despair alone.

When focusing solely on child labour in cocoa farming, the context of this labour 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, family composition and economic situation, and available educational opportunities. For example, moving children away from cocoa into domestic services or subsistence farming may not only have very similar welfare consequences as 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 towards children with lower probability of school enrolment. Results of the analysis 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 arrangement might have a better long-term effects.

In many cases, part of the reason why child labour – including harmful child labour – exists 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 the society, by producing successive generations of adults who lack the basic skills needed for work in a modern economy. Adults who once were child labourers themselves often submit their own children to the same life pattern, leading to a kind of vicious cycle, hence perpetuating this downward spiral. There is no simple, or even a dominant way of approaching the problem. Government agencies need not go alone. According to the World Bank (2001), some of the more successful initiatives against child labour have been the result of partnerships in which businesses have come together with communities, government agencies, non-government organizations and international organizations to work toward a common objective.

Notes

1. In the most recent buying season, however, prices rebounded substantially partly because of the insurrectional situation in Côte d'Ivoire.

2. The survey is described in detail in the IITA report (2002).

3. Throughout this paper, this category is designated by "children".

4. 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, "membership of farmer organization" and "last year cocoa price" were used as instruments.

References

Amemiya, T. 1981. "Qualitative response models: A survey". *Journal of Economic Literature*, XIX (December): 1483–536.

Andvig, J.C. 2001. *Family-Controlled Child Labor in Sub-Saharan Africa – A Survey of Research*. Social Protection Discussion Paper No 0122. The World Bank, Washington, D.C.

Andvig, J.C., S. Canagarajah and A. Kielland. 2001. "Issues in child labor in Africa". Africa Region Human Development Working Paper Series 14. The World Bank, Washington, D.C.

Basu, K. 1997. *Analytical Development Economics: The Less Developed Economy Revisited*. Cambridge, Massachusetts: MIT Press.

Basu, K. 1999. "Child labor: Cause, consequence and cure, with remarks on international labor standards." *Journal of Economic Literature*, 37(3, Sept.): 1083–119.

Bekombo, M. 1981, "The child in Africa: Socialisation, education and work". In G. Rodgers and G. Standing, eds., *Child Work, Poverty and Underdevelopment.* Geneva: ILO.

Bhalotra, S. and C. Heady. 2001. "Child farm labour: The wealth paradox". Department of Economics, University of Bristol, England.

Bonnet, M. 1993. "Child labor in Africa". *International Labor Review*, 132(3): 371–89.

Boyden, J. 1991. "Working Children in Lima, Peru"" In W.E. Myers, ed., *Protecting Working Children.* London: Zed Books Ltd. in association with UNICEF (United Nations Children's Fund).

Canagarajah, S. and H. Coulombe 1997. "Child labor and schooling in Ghana". Mimeo. Africa Technical Department, The World Bank, Washington, D.C.

Canagarajah, S. and H. Coulombe. 1998. "Child labor and schooling in Ghana". Policy Research Working Paper No. 1844. The World Bank, Washington, D.C.

Case, A., C. Paxson and J. Albeidieger. 2002. "Orphans in Africa". Center for Health and Wellbeing. Research Program in Development Studies, Princeton University, USA.

Coulombe, H. 1998. "Child labor and education in Côte d'Ivoire". Unpublished paper written for the World Bank.

Cramer, J.S. 1991. *The Logit Model for Economists*.: London and New York: Edward Arnold.

Fluitman, Fred. 2001. *Working but Not Well: Note on the Nature and Extent of Employment Problems in Sub-Saharan Africa*. Occasional papers. International Training Centre of the International Labour Organization, Turin, Italy.

Greene, W.H. 1991. *Econometric Analysis*. Englewood Cliffs, NJ: Prentice Hall.

Greene, W.H. 1992. *LIMDEP Version 6.0 User's Manual and Reference Guide*. New York: Econometric Software, Incorporated.

Grootaert, C. 1998. "Child labor in the Ivory Coast". World Bank Policy Working Paper No. 1905. The World Bank, Washington, D.C.

Grootaert, C. and R. Kanbur. 1995. "Child labor: A review". Background paper for the 1995 World Development Report on Labor. The World Bank, Washington, D.C.

Heady, C. 2003. "The effect of child labor on learning achievement". *World Development*, 31(2): 385–98.

IITA. 2002. *Child Labour in the Cocoa Sector of West Africa: A Synthesis of Findings in Cameroon, Côte d'Ivoire, Ghana and Nigeria*. STCP-Report International Institute of Tropical Agriculture, Ibadan Nigeria.

Ilon, L. and P. Moock. 1991. "School attributes, household characteristics and demand for schooling: A case study of rural Peru". *International Rev. of Education*, 37(4): 429–52.

ILO/SIMPOC. 2002. *Every Child Counts – New Global Estimates on child Labour*. Geneva: International Labour Office.

Iversen, Vegard. 2000. "Child labour in bargaining peasant households in sub-Saharan Africa". Unpublished paper. School of Development Studies, University of East Anglia, UK.

Kebede, Y., K. Gunjal and G. Coffin. , 1990. "Adoption of new technologies In Ethiopian agriculture: The case of Tegulet-Bulga District, Shoa Province". *Agricultural Economics*, 4: 27–43.

Lindert, P. 1976. "Child costs and economic development". In R.A. Easterlin, ed., *Population and Economic Change in Developing Countries*. Chicago: University of Chicago Press.

Madalla, G.S. 1983. *Limited Dependent and Qualitative Variables in Econometrics*. New York: Cambridge University Press.

McConnell, R.C. and S.L. Brue. 1989. *Contemporary Labor Economics*, Second Edition. New York: McGraw Hill.

Nkamleu, G.B. and A.A. Adesina. 2000. "Determinants of chemical input use in peri-urban lowland systems: Bivariatee probit analysis in Cameroon". *Agr. Systems*, 62: 1–11.

Nkamleu G.B. and O. Coulibaly. 2000. "Les determinants du choix des methodes de luttes contre les pestes dans les plantations de cacao et cafe du sud-cameroun". *Revue Economie Rurale*, No. 259 Sept-Oct, 2000: 75-85.

Patrinos, H. and G. Psacharopoulos 1994. "Educational Performance and Child Labor in Paraguay". *International Journal for Educational Development*, 15(1): 47-60

Polson, R., and D.S.C. Spencer. 1991. "The technology adoption process in Subsistence agriculture: The case of cassava in Southwestern Nigeria". *Agric. Syst.*, 36: 65–78.

Psacharopoulos, G. and A.M. Arriagada. 1989. "The determinants of early age human capital formation: Evidence from Brazil". *Economic Development and Cultural Change*, 37: 683–708.

Rivers, D., and H. Vuong. 1988 "Limited information estimators and exogeneity tests for simultaneous probit models" Journal of Econometrics, 39: 347-66

Siddiqi, F. and H. Patrinos. 1995. "Child labor: Issues, causes and interventions". Human Resource Development Working Paper No. 56. The World Bank, Washington, D.C.

Singh, R. and G.E. Schuh. 1986. "The economic contribution of farm children and the household fertility decisions: Evidence from a developing country, Brazil". *Indian Journal of Agricultural Economy*, 41(1): 29–40.

Tienda, M. 1979. "Economic activity of children in Peru: Labor force behavior in rural and urban contexts". *Rural Sociology*, 44: 370–91.

White, Ben. 1994. "Children, work and 'child labour': Changing responses to the employment of children". *Development and Change*, 25: 849–78.

World Bank. 2001. *Addressing Child Labor in the Workplace and Supply Chain*. Good Practice Note: Report produced by the International Finance Corporation, Environment and Social Development Department, Washington, DC, June, No. 1.

Wooldridge, J.M. 2002. *Econometric Analysis of Cross Section and Panel Data*. Cambridge, Massachusetts: MIT Press.

Appendix: Model results

Table A1: Results from the first-stage OLS

Variables	Coefficient	t-statistic	P-value
Constant	2.5478	5.51	0.000
SEXCHILD	-0.0606	-1.38	0.167
AGECHILD	-0.1727	-2.28	0.023
AGECHSQ	0.0085	2.24	0.025
BIOCHILD	0.1485	2.93	0.003
COCOAEXP	0.0042	1.73	0.083
AGEP	-0.0110	-5.30	0.000
Household head's education level			
Primary (1–6 years)	-0.0540	-1.01	0.312
Secondary1 (7–9 years)	0.0143	0.18	0.857
Post secondary1 (10+ years)	-0.3211	-2.35	0.019
HQUALITY			
Medium quality	-0.0762	-1.25	0.210
High quality	0.0116	0.18	0.861
HHSIZE	-0.0681	-2.29	0.022
HHSIZSQ	0.0039	3.01	0.003
DEPRATIO	0.1811	1.05	0.295
CACAOPRO	-0.0180	-2.00	0.046
AREAFOOD	0.0011	0.62	0.535
AREAOTPE	0.0086	1.96	0.050
NSHACROP	0.0788	3.00	0.003
SPCOAREA	-0.0502	-1.97	0.049
SPYIELDC	0.8032	9.00	0.000
SPAREANC	-0.0070	-0.75	0.455
SPHHQUAL	0.1068	1.12	0.261
WEST	-0.0485	-0.39	0.694
EAST	-0.0586	-0.49	0.622
CTWEST	0.1318	1.50	0.133
MEMBER OF FARMER_ORG	-0.2601	-5.03	0.000
LAST_COCOA_PRICE	0.0000	0.13	0.897
R^2	0.23		
N	1104		
F(27, 1076)	12.11 ***		

Table A2: Multinomial logit model of work/school choice in the cocoa sector of Côte d'Ivoire, male children aged 6–14

Variables	Child status					
	Work only		School only		Work and school	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	-19.9295	-2.97 ***	-10.4078	-2.10 **	-17.7198	-3.36 ***
AGECHILD	3.0154	3.01 ***	2.2284	2.96 ***	3.2676	4.10 ***
AGECHSQ	-0.1324	-2.66 ***	-0.1119	-2.93 ***	-0.1478	-3.70 ***
BIOCHILD	0.1009	0.19	0.0463	0.12	0.0831	0.21
COCOAEXP	-0.0062	-0.24	-0.0230	-1.18	0.0094	0.46
AGEP	0.0300	1.00	0.0155	0.69	0.0171	0.72
Household head's education level						
Primary (1–6 years)	-0.2574	-0.46	0.1579	0.38	0.1692	0.39
Secondary1 (7–9 years)	-0.2948	-0.32	0.1169	0.17	1.0422	1.45
Post secondary1 (10+ years)	-1.0349	-0.85	-1.2524	-1.41	-1.8373	-1.88 **
HQUALITY						
Medium quality	-0.0403	-0.06	-0.8132	-1.53	-0.5125	-0.93
High quality	-0.3926	-0.58	-0.5143	-0.98	-0.8196	-1.49
HHSIZE	-0.0945	-0.31	0.0573	0.25	-0.1223	-0.50
HHSIZSQ	-0.0046	-0.33	-0.0032	-0.30	0.0007	0.07
DEPRATIO	-0.7595	-0.44	-1.7841	-1.33	-2.9752	-2.12 **
CACAOPRO	0.1635	1.91 *	0.0246	0.38	-0.0010	-0.01
AREAFOOD	0.0149	0.75	0.0128	0.72	0.0056	0.31
AREAOTPE	-0.0457	-1.10	-0.0121	-0.38	-0.0479	-1.35
YIELDCL (predicted)	2.6718	1.36	-0.4172	-0.27	-0.2307	-0.14
NSHACROP	-0.5757	-1.65	-0.0200	-0.08	-0.1420	-0.52
SPCOAREA	0.0079	0.03	0.0684	0.31	0.0656	0.29
SPYIELDC	-0.9936	-0.52	0.9582	0.64	1.4706	0.95
SPAREANC	0.0934	0.88	-0.0160	-0.18	0.0734	0.81
SPHHQUAL	0.3987	0.38	0.0005	0.00	-0.1389	-0.17
WEST	0.0139	0.01	0.1385	0.15	0.4184	0.42
EAST	-0.2717	-0.22	1.2467	1.32	1.6664	1.67 *
CTWEST	-0.1461	-0.14	1.7418	2.19 **	1.8374	2.18 **

X-(54) = 244.04 ***
Percentage of correct predictions of child utilization categories = 41.3 %
log-Likelihood function = -606.07
Sample = 632

*** significant at 0.01; ** significant at 0.05; * significant at 0.10.

Table A3: Multinomial logit model of work/school choice in the cocoa sector of Côte d'Ivoire, female children aged 6-14.

Variables	Child status					
	Work only		School only		Work and school	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	-12.4552	-2.49 ***	-10.6377	-2.63 ***	-18.4429	-4.06 ***
AGECHILD	1.8522	2.45 ***	2.0731	3.44 ***	3.3107	4.84 ***
AGECHSQ	-0.0724	-1.92 *	-0.0977	-3.16 ***	-0.1463	-4.25 ***
BIOCHILD	-0.0901	-0.15	0.1075	0.21	0.3890	0.69
COCOAEXP	0.0162	0.64	0.0099	0.47	0.0214	0.92
AGEP	0.0127	0.39	0.0173	0.64	0.0222	0.76
Household head's education level						
Primary (1-6 years)	-1.3279	-2.38 **	0.0466	0.10	-0.4979	-1.01
Secondary1 (7-9 years)	-1.4639	-1.94 **	-0.4085	-0.66	-0.5358	-0.81
Post secondary1 (10+ years)	-1.1100	-0.68	0.2838	0.23	0.0882	0.07
HQUALITY						
Medium quality	-0.2479	-0.40	-0.0128	-0.03	0.2790	0.52
High quality	0.2029	0.32	0.6438	1.19	0.5120	0.89
HHSIZE	0.3252	0.93	0.3346	1.17	0.1372	0.45
HHSIZSQ	-0.0156	-1.01	-0.0184	-1.46	-0.0055	-0.42
DEPRATIO	-3.6642	-1.96	-2.3371	-1.54	-4.0207	-2.43 ***
CACAOPRO	0.0626	0.59	-0.0208	-0.23	0.0600	0.60
AREAFOOD	-0.0747	-1.50	-0.0652	-1.77 *	-0.0237	-0.92
AREAOTPE	-0.0797	-1.76 *	-0.0419	-1.42	-0.1036	-2.39 **
YIELDCL (predicted)	2.9131	1.52	1.1689	0.72	2.8921	1.66 *
NSHACROP	-0.4270	-1.58	-0.1140	-0.53	-0.3932	-1.66 *
SPCOAREA	0.6407	2.26 **	0.2830	1.22	0.3175	1.27
SPYIELDC	-3.6851	-1.85 *	-1.9557	-1.16	-3.3974	-1.90 **
SPAREANC	0.3188	2.23 **	0.2070	1.57	0.3454	2.58 ***
SPHHQUAL	-1.3434	-1.27	-0.6033	-0.70	-1.8531	-1.97 **
WEST	-0.4168	-0.37	-1.3368	-1.39	-1.2054	-1.16
EAST	-0.3588	-0.34	-0.1003	-0.12	-0.3603	-0.39
CTWEST	0.4207	0.51	0.4549	0.70	0.7212	1.01

X-(54) = 203.77***
Percentage of correct predictions of child utilization categories = 53.3 %
log-Likelihood function = -492.04
Sample = 471

*** significant at 0.01; ** significant at 0.05; * significant at 0.10.

Table A4: Marginal effect of the multinomial logit model of work/school choice in the cocoa sector of Côte d'Ivoire

Variables	Marginal impact							
	Work only		School only		Work and school		Neither	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	-0.17491	-0.70	1.39237	2.92 ***	-2.16928	-4.56 ***	0.951814	4.45 ***
SEXCHILD	-5.15E-02	-2.81 ***	-1.46E-02	-0.42	9.71E-02	2.82 ***	-3.09E-02	-2.02 **
AGECHILD	-2.20E-02	-0.61	-0.15892	-2.33 ***	0.361968	5.28 ***	-0.18106	-6.12 ***
AGECHSQ	1.95E-03	1.11	4.87E-03	1.42	-1.52E-02	-4.47 ***	8.35E-03	5.57 ***
BIOCHILD	-1.54E-02	-0.64	-4.10E-03	-0.09	4.04E-02	0.92	-2.09E-02	-1.06
COCOAEXP	1.02E-04	0.10	-5.41E-03	-2.70 ***	5.51E-03	2.76 ***	-2.10E-04	-0.24
AGEP	5.59E-04	0.45	-1.42E-04	-0.06	4.93E-04	0.22	-9.11E-04	-0.84
Household head's education level								
Primary (1–6 years)	-6.56E-02	-2.89 ***	6.21E-02	1.50	-4.42E-03	-0.11	7.92E-03	0.41
Secondary1 (7–9 years)	-6.73E-02	-2.03 **	-6.24E-02	-1.01	0.119817	2.02 **	9.89E-03	0.34
Post secondary1 (10+ years)	-2.17E-02	-0.35	5.16E-02	0.45	-9.53E-02	-0.82	6.55E-02	1.43
HQUALITY								
Medium quality	-1.72E-04	-0.01	-8.03E-02	-1.64 *	6.10E-02	1.28	1.95E-02	0.87
High quality	-1.90E-02	-0.74	4.47E-02	0.89	-3.05E-02	-0.61	4.80E-03	0.22
HHSIZE	4.59E-03	0.34	3.28E-02	1.30	-3.21E-02	-1.30	-5.21E-03	-0.48
HHSIZSQ	-4.27E-04	-0.68	-1.08E-03	-0.93	1.11E-03	0.97	3.97E-04	0.80
DEPRATIO	-6.40E-03	-0.09	0.195897	1.44	-0.34035	-2.55 ***	0.150853	2.47 ***
CACAOPRO	7.83E-03	2.21 **	-5.06E-03	-0.68	-2.65E-03	-0.34	-1.23E-04	-0.04
AREAFOOD	-7.28E-05	-0.10	1.44E-03	1.04	-1.29E-03	-0.97	-7.42E-05	-0.09
AREAOTPE	-1.31E-03	-0.68	8.40E-03	2.10 **	-9.87E-03	-2.30 **	2.78E-03	1.94 **
YIELDCL (predicted)	0.171538	2.19 **	-0.25263	-1.68 *	0.120589	0.81	-3.95E-02	-0.55
NSHACROP	-2.56E-02	-1.98 **	5.56E-02	2.32 **	-4.49E-02	-1.86 *	1.49E-02	1.43
SPCOAREA	1.35E-02	1.21	-1.02E-02	-0.48	8.69E-03	0.42	-1.20E-02	-1.17
SPYIELDC	-0.1409	-1.87 *	0.114945	0.82	-7.45E-03	-0.05	3.34E-02	0.49
SPAREANC	5.21E-03	1.34	-2.13E-02	-2.67 ***	2.35E-02	3.21 ***	-7.39E-03	-1.60 *
SPHHQUAL	1.41E-03	0.03	7.34E-02	1.01	-9.85E-02	-1.36	2.36E-02	0.67
WEST	3.20E-02	0.67	-6.12E-02	-0.64	-1.01E-02	-0.11	3.93E-02	0.97
EAST	-5.05E-02	-1.06	3.68E-02	0.42	4.86E-02	0.55	-3.50E-02	-0.91
CTWEST	-7.15E-02	-1.79 *	5.81E-02	0.80	8.02E-02	1.10	-6.68E-02	-2.14 **

Probabilities at the mean vector are:
Work only = 0.093
School only= 0.452
Work and School = 0.384
Neither = 0.072

*** significant at 0.01; ** significant at 0.05; * significant at 0.10.

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