

Comparative study of working conditions of children from agricultural households in Burkina Faso, Cote d'Ivoire and Mali

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1. Introduction

In Sub-Saharan Africa, the phenomenon of child labor is akin to a real social plague (Ngodi, 2009). In fact, the involvement of children in adult work is a cultural practice rooted and valued in both rural and urban areas (Marcoux, 1994). Thus, in a cultural environment conducive to the use of child labor force, the response to the use of child labor was still in the late eighties (80), indifference resignation, or even denial.

However, since the early 90s, giving reversed and this reality is now opposed by the international representatives as well as by national legislation, especially after the dynamics generated by the Harkin & Engel protocol (2001), whose purpose is to combat the worst forms of child labor in the economies of cocoa plantations in Côte d'Ivoire and Ghana.

In agricultural households that are the subject of this study, the phenomenon requires special attention. Indeed, the agricultural sector is one where the incidence of child labor is highest (70%: FAO, 2010). Numerous children stemming from agricultural households are forced to hard and dangerous or painful labor. These children are also exposed to toxic herbicides, dust, disease and unsanitary conditions. This study will, in a comparative perspective, make a broad inventory of the phenomenon in Burkina Faso, Côte d'Ivoire and Mali, in order to grasp the true scale and identify the essential characteristics. It also attempts to analyze other aspects - poverty, education, spatial mobility, etc. - Inherent to the problem of child labor.

2. Research methodology

The data used for this study come from a series of surveys on agricultural households, commissioned by the U.S. Department of Labor, overseen by the University of Tulane (Louisiana).

These surveys took place in 2009 and cover three (03) Countries: Burkina Faso, Côte d'Ivoire and Mali. Data were collected on the basis of a poll in two degrees; the primary unit being the enumeration area (Burkina, Mali) or enumeration district (Cote d'Ivoire) and the secondary unity, the agricultural households.

The study focus on a sample of 719 (Burkina Faso), 1458 (Ivory Coast) and 741 (Mali) children aged 10 to 17 years of age.

Regarding the methodology, it should be noted that the tools of econometric analysis will identify correlations between certain variables, as well as how they depend on each other.

▪ *Determinants of Child Labour : the global models*

Explanatory factors of child labor will be estimated following binary logistic models to be applied to dichotomous variables constructed for this purpose, and indicating for each of the three (03) countries, if the child was active or not during the twelve (12) months preceding the survey.

Hausman tests will permit to choose the appropriate form of distribution of the errors, and the sidelining of outliers, influential, atypical or high power will get the most efficient model possible. It will be also conducted tests for heteroscedasticity as well as tests of multi collinearity among the explanatory variables. If necessary, adjustments will be made using appropriate statistical procedures.

From a formal point of view, child labor is explained by a discrete choice model where children (or their parents) choose to work (to make them work) or not. Considering Y_j endogenous variable indicating whether the child works or not, the representation from each of three (03) countries will have the following form:

$$(S_1) Y_j = 1 \text{ if the child is working ; } 0 \text{ else } (1)$$

The purpose is to explain $E[Y_j]$ by a set of variables or factors related to the child, family environment to which it belongs, to the household head from which it originates and to the geographical localization.

To do this, the approach by the method of latent variables will be privileged (Rakotomalala, 2009). So, each variable of interest Y_j (observable) depends on an unobservable variable Y_j^* (latent variable) directly linked a priori to all the above variables. The new obtained specification is:

$$(S_2) Y_j = 1 \text{ si } Y_j^* > 0 ; 0 \text{ else, with } Y_j^* = \beta' X_j + \epsilon_j \quad (2)$$

where β is a vector, whose parameters were unknown, and will be afterward esteemed. ϵ_j is the error term that includes possible errors of measure, samplings and specification (Green, 2002). These errors are supposed identically and independently distributed, according to a logistic law (for the three countries)¹. The X_j are vectors containing the explanatory variables of the child labor. The link existing between Y_j and $\beta' X_j$ is thus given by: $P = E(Y_j = 1 | X_j) = \Phi(\beta' X_j)$, where Φ is the distribution function of a logistic law.

The estimation will be made by the MLE procedure: the maximization of the likelihood function.

▪ **Estimate of decisions of child activities participation: the specific models**

The estimated participation decisions of child workers in agriculture, other economic and domestic agriculture can be done in two (02) approaches: an integrated approach (simultaneous estimations) and an independent approach (separate estimations). This latter approach seems unrealistic (Dumas, 2005), because it implies (by assumption) that these decisions are independent (which is somewhat unlikely).

The present study will thus opt for a simultaneous equations model. This model will determine the probabilities of making an agricultural activity, an economic or domestic activity, by taking into account the interdependence of the choice of participation, the simultaneity of decisions on allocation of the working time of the children and the possibilities of double or triple participations. In doing so, the probable correlations between the residuals of the equations, if they had been estimated according to the first approach, will be corrected. The procedure of Cappellari and Jenkins (2003) will be followed to build a *multivariate probit model*. So, this model will permit to estimate these different probabilities. The choice of explanatory variables will be based on the main works dealing with this issue and the overall model presented above (global model). This model will solve possible problems related to the endogeneity of choice of participation as well as the violation of the assumption of independence of irrelevant alternatives.

Formally, it will be considered simultaneously, three (03) binary probit for each of the three (03) countries under study. The decision to allocate time to one or other of these activities will depend on several factors such as generally defined in the global model of the determinants of child labor (see previous model). Let Y_{im} observable variable interest (binary) indicating the participation or not of the child i to the activity m . The following system of equations is obtained:

$$(S_3) Y_{im} = 1 \text{ if the child } i \text{ participate to the activity } m ; 0 \text{ else, with } m = \{1, 2, 3\} \quad (3)$$

Remarks: $i = \{1, 2, 3, \dots, N\}$ with $N =$ number of children;

$m = 1$: Agricultural activities; $m = 2$: Non-agricultural economic activities; $m = 3$: Domestic activities.

Each variable of interest Y_{im} depends on an unobservable variable Y_{im}^* directly related to exogenous variables corresponding a priori to those of the overall model. The new specification provides as follows:

$$(S_4) Y_{im,j} = 1 \text{ si } Y_{im}^* > 0 ; 0 \text{ else, with } Y_{im}^* = \beta'_m X_{im} + \epsilon_{im}, \quad m = 1, 2, 3 \quad (4)$$

The ϵ_{im} , $m = 1, \dots, 3$ are the residuals of equations expressing the participation (or not) to the three activities for individual i . They include possible errors of measure, samplings and specification. These errors are jointly distributed according to a trivariate normal distribution with zero (like mean) and variance-covariance matrix Σ : $\epsilon_{im}, m = 1, \dots, 3 \rightarrow \mathcal{N}(0, \Sigma)$; Σ is a symmetric matrix (3×3) with the value 1 on its main diagonal, and elsewhere, the correlation coefficients $\rho_{ij} = \rho_{ji}$ between error terms of the different equations estimated. In case of independence of these decisions, these coefficients are zero. By cons, they are significantly different from zero if such decisions are interdependent.

X_{im} are the vectors containing the explanatory variables of choice for children's participation in each activity. These variables are not necessarily the same for all three (03) sectors. Indeed, only the significant variables and / or enhance the overall significance of the global model presented in the previous section were

¹ The choice of distribution form for the data available was enacted by the Hausman test at 5% significance. For Burkina Faso and Mali, the difference between the logit and probit is not significant. The choice fell on the logit because of its ease of interpretation. As for the case of Côte d'Ivoire, the test revealed a significant difference between the two (02) models. A comparative analysis regarding to the information criteria was permit to choose finally the logit model.

considered. The criterion of contribution to the consistency of the model was also selected in the choice of these variables. They are generally related to the child, the householder or geographic characteristics.

- ***Variables influences on the worst forms of child labor: the sequential models***

Finally, using a logistic sequential model, the specifics concerning the worst forms of child labor will be emerged. This will be particularly interested in the issue of the worst forms of child labor to identify influential factors in each of the three (03) countries in the study.

Notice: It should be noted that in order to build the different models mentioned above, it will be considered a specific analysis variable: a composite index of overall poverty level of households in which children live. This index will be constructed on the basis of the fuzzy sets theory (Zadeh, 1965) on the extent of poverty in many dimensions, in terms of deprivation² level. In this study, five dimensions have being identified: housing, comfortable living environment, possession of durable goods, income and ownership of land assets.

3. Estimation results

3.1 The determinants of children participation to work (refer annex appendix, global model)

Within three (03) countries covered by the study, child labor does not depend on the nationality of these, or their place of birth³ or even the relationship of these with the head household. The lack of significance of the relationship shows that the argument that participation in socio-economic activities of the household is one of the main reasons for children's mobility does not fit in the context of the surveyed households. Indeed, the fact of being a biological child of the household head, or then, to be a child "confided" or related to the household will not affect the propensity of children to participate in the workforce. Furthermore, the perception that children have the usefulness of the school does not seem to affect significantly in their propensity to work or not. This can be explained by the fact that the decision to work and / or going to school is not their job, in general, but belongs to their parents who may have other concerns (such as financial gains in the short term). In addition, competition does not seem to put in the work and schooling decisions since children often associate with little difficulty, these two occupations. Furthermore, household size is not significant (even at 10%) in explaining the phenomenon, contrary to the structure of these that seems more appropriate to understand what can bring a child in a family or household to engage in an activity. This confirms the spillovers ("trickle down effect") postulated by strategic models, and are thus due to the composition of households. In addition, the method of financial decision in the households surveyed did not play any role in the propensity of children to work. This can be explained by the fact that, even though the person taking these types of decisions may differ from one household to another, the motivation behind it is often the same: to maximize household income. Furthermore, it seems that the sex of the household head as well as its academic level are not decisive in explaining the phenomenon of child labor. Moreover, the strong representation of men in the subpopulation of household heads can understand why the sex of the household head does not play a major role. Within three (03) countries studied, the variables explaining the propensity of children to work are related to the child's age, sex and status of education, structure and level of poverty of the household membership as well as the presence status of his parents, occupation status of household head and its geographical location. In fact, even if these variables explain the general phenomenon of child labor in three (03) countries, it should be noted that the specificities remain a country to another. In Burkina Faso, the household structure, the presence status of parents, the occupation status of head of household and geographic characteristics influence the probability of child labor. In Mali, the sex of the child would be a factor. In addition, the household structure, the presence status of parents, but also, and unlike in Burkina Faso, the status of schooling are concerned. Regarding the case of Côte d'Ivoire, it's necessary to notice that the influential factors are far more numerous. Indeed, apart from all the above factors for Burkina Faso and Mali, it would add the age factor and the level of poverty. In a more generalized, it should be noted that Burkinabe children are those most likely to work or be active (predicted marginal probability equal to 0.57). They are followed by children in Mali (0.52); the Ivorian children are those who have relatively less chance of working, although with a probability of 0.43.

3.2 Estimation of children's participation in various activities (ref. annex appendix, specific model)

Analysis of variables influencing the sectorial interests: the estimated equations are significantly nonzero in the three (03) countries, which shows that decisions participation in the three (03) different activities are

² Over this index is strong, and the household is considered poor.

³ These two variables decrease the explanatory power of models constructed.

dependent on each other. Also, the choice of attending one of three (03) activities depend not only on the attributes specific to each of them, but also the availability of alternatives (of the others activities). Moreover, these coefficients are all positive, indicating that whatever the country concerned, the probability of a child to participate in agricultural activities that positively influence a child to work in the area of other economic activities as well as probability of child participation in domestic activities. Because of the transitivity property (the reverse reasoning is always available), it is possible to conclude to the existence of complementarity link between these three (03) types of activity. Regarding the variables of influence on the different activities (sectorial analysis), the age (Cote d'Ivoire, Mali), the sex and the geographical location are the key factors that seem most critical in participation sector activities in the three (03) countries. By cons, poverty is crucial just in Côte d'Ivoire.

Analysis of marginal probabilities of participation: children have roughly an even chance to work in agricultural and domestic sectors in Mali, the marginal propensity to work in the economic sector is only 0.12. In Côte d'Ivoire, that's about the same thing that is observed, with however, a lower degree lower concerning agricultural and domestic sectors (nearly 0.36). Thus, an ivorian child have particularly one in three chance of working in the agricultural and domestic sectors. The situation in Burkina is a bit skewed towards the agricultural sector for which children have more than one in two chance of working. This sector is followed by domestic activities (0.42), non-agricultural economic activities coming in third (0.09).

Analysis of the predicted probabilities of participation: In terms of interrelationships between the various activities made by children, it turns out, by analyzing the predicted probabilities, that the dependences and interrelations noticed between the decisions of participation by means of the likelihood ratio tests are justified in these three (03) countries, but also, that significant disparities exist between them. Indeed, in Burkina Faso, a child is more likely to work exclusively in agriculture (0.43) and domestic (0.34) sectors. The chances so he participates to both agricultural and domestic activities is 0.30. He has very little chance to participate exclusively in economic activities (0.02) or to curb economic and agricultural activities (0.009). As regards a concomitant participation to three types of activities, the chances are only 0.074. As for Côte d'Ivoire and Mali, it's in the domestic work that the chances of an exclusive participation are greatest (0.26 in Côte d'Ivoire, 0.38 in Mali). Then comes the agricultural sector and a concomitant participation to the agricultural and domestic works. As regards a simultaneous participation to three (03) types of activities, it appears that the chances are far greater for children of both countries, compared to the case of Burkinabe children (0.07). They are in fact, 0.11 for both (02) countries (Côte d'Ivoire and Mali). For this last country (Mali), the children have no chance to work exclusively in the agricultural and economic sectors. Finally, the probability that children not participate in any of the three (03) activities is higher in Côte d'Ivoire (0.55). This country is followed by Mali (0.48) and Burkina Faso (0.43). These results are consistent with those expected, the incidence of child labor is higher in Burkina Faso, followed by the Mali and Cote d'Ivoire.

Analysis of conditional probabilities of participation : in Burkina Faso and Côte d'Ivoire, the probability for a child to be active in the domestic activities knowing that he engages in an agricultural or economic (other than agricultural) is 0.73 (Burkina Faso) and 0.78 (Côte d'Ivoire). In Mali, the probability is much higher. Indeed, in the latter country, the chance for a child to be employed in domestic activities while he is already in economic activities is 0.95. Conversely, the propensity for children to be occupied in the group of economic activities knowing they are already active in domestic activities are much more balanced in three (03) countries. However, the group Burkina Faso - Mali differs somewhat from the Ivory Coast. This conditional probability is, in fact, equal to 0.94 for Mali, 0.92 for Burkina Faso, while ivorian children whose are in this situation have a relatively lower level (0.86).

In general, the conditional distributions highlight conditional propensities rather high, what shows that spillover effects exist well in terms of the participation in the activities inherent to the various sectors. It confirms and strengthens the hypothesis of dependence between the decisions of participation to each of these activities at the same time as it certifies the link of complementary between these.

3.3 Explanatory factors of the worst forms of child labor (refer table, sequential model)

Through the analysis of significant variables, several lessons can be learned. The most important are the following ones: (i) In Burkina Faso, the children whose parents primarily derive their income from salaried work are 15 times more likely to be required to work in its worst forms (forced labor). This can be explained by the fact that these parents force their children to work in the fields. In fact, they don't have enough time to devote to farming activities since their income come from other types of work (salaried). Moreover, the phenomenon of the worst forms of child labor is much more common in areas of intensive emigration, (ii) In Côte d'Ivoire, children aged 10 to 14 have about 45% less likely to being forced to the worst forms of work

that primarily affect the 15-17 years. It is the same for children living with only their mother. In addition, children from households whose main income comes from a liberal work seem less vulnerable, (iii) In Mali, the fact that a child does not live with his father or his mother preserves them against the worst forms of work. Moreover, when their parents get their income primarily from a liberal work, children are less likely to be subjected to the worst forms of child labor.

Clearly, the factors that explain children's exposure to the worst forms of labor are not the same in the 3 countries. Moreover, it appears that the poverty level doesn't seem to be a principal cause of the worst forms of child labor in the 3 countries. Indeed, poor households don't seem to be more exposed to these forms of work as suggested by the non-significance of the variable „class of poverty“ in these 3 surveyed countries.

4. Conclusion and recommendations

This study allowed to go beyond the question of the worst forms of child labor to establish a global descriptive plan following a new approach taking into account a certain shape of domestic work. Beside, this study has permit to nuance some conclusions reached predefined by international institutions dealing with the problem of child labor (ILO, UNICEF, etc.). These conclusions are appearing risky in the sub-Saharan socioeconomic context, especially in Burkina Faso, Côte d'Ivoire and Mali. The systematic link made between promotion of education and reduction of the child labor, the systematic link made between household poverty, mobility of the children and incidence of child labor, do not always seem to prevail in a indisputable way in the case studies of this present analysis. The child labor appears to fall within a socio-economic logic inherent in African societies, which often has a rational sense, especially in Burkina Faso and Mali where the poverty plays no significant role in explaining the phenomenon.

In term of this study, elements of recommendations (to the national or international agencies) going to the sense of an effective fight against the child labor under these unacceptable forms must be proposed.

First of all, this study allowed to note that the incidence of child labor is significantly important in the agricultural world. It is therefore vital that organizations working against child labor in the three (03) countries are stepping up their efforts in agriculture world by directing firstly their actions on the agricultural and domestic word. Secondary, it should be noted that most of the children who work are also schooled. The schooling is not thus the simple result of an arbitration from the work. Building on the only one promotion of schooling, with a view to putting an end to the child labor, is therefore a strategy doomed to failure.

Furthermore, the role of poverty seems quite limited for the cases of Burkina Faso and Mali. In fact, social norms favors the use of child labor in these countries. It's more effective to focus on the future utility of schooling and / or "not work" of the children, concerning the maximizing of the satisfaction of households. Moreover, the geographical location plays a key role especially in Burkina Faso and Cote d'Ivoire. In Cote d'Ivoire, it appears that the incidence of child labor is highest in areas of intensive cultivation of cocoa. In addition, the sequential models showed, through the cross effect of schooling and localization that the worst forms of child labor are more present in these areas. The conclusions that prevailed at the start of the Harkin & Engel protocol are thus confirmed. Priority actions must be undertaken in theses areas. However, the magnitude of child labor is also alarming in other regions. It is therefore necessary to concentrate efforts in both cocoa producing regions than in non-production cocoa areas. Especially in Mali and Burkina Faso, these are the areas of medium and high intensity of emigration which are most affected by the phenomenon. Priority actions must be undertaken by the agencies concerned by the problem of child labor in these regions. Finally, because of differences in explanatory factors across countries regarding children's exposure to the worst forms of labor, the strategies need to be adapted to each country because a standard and unique strategies are a priori doomed to failure. The preferred strategies should also focus on educating parents and the adoption of coercive legal measures to fight for eradication.

5. Bibliography

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ANNEX APPENDICE: Estimations results table (global, specifics and sequential models)

ESTIMATED MODELS	Global model : logistic model (marginal effects)			Specific models : multivariate probit (marginal effects)									Sequential model (odds ratios)		
				Burkina Faso			Cote d'Ivoire			Mali					
VARIABLES	Burkina	CI ²	Mali	Agricultural	Economic	Domestic	Agricultural	Economic	Domestic	Agricultural	Economic	Domestic	Burkina	CI ²	Mali
Child characteristics															
Age group – 10-14 years old ¹	-0,046	-0,086**	-0,063				-0,207**	-0,259**	-0,177**		-0,346**	0,066	0,572	0,471**	1,036
Sex – Boy ¹	-0,033	-0,231**	-0,195**		-0,382**	-0,745**	-0,312**	-0,538**	-0,880**	-0,194**	-0,360**	-0,502**	2,098	1,179	1,369
recent schooling – of school	-0,030	0,171**	0,076				0,438**	0,357**	0,365**	0,114	0,136	0,131	6,201	0,772	0,358
Family environment															
Number of 0 – 5 years old people	-0,005	0,036**	-0,018	0,022	-0,032	0,013	0,069**	0,025	0,055**		-0,070		0,983	0,978	1,184
Number of 6 – 14 years old people	0,006	-0,035**	0,025	-0,025	0,049	0,032	-0,043	-0,071**	-0,038		0,037		0,909	1,055	1,035
Number of 15 – 17 years old people	-0,098**	-0,012	0,100**	-0,102	0,016	-0,135**	-0,071**	-0,089**	-0,039		-0,024		1,196	1,392**	0,846
Number of 18 – 54 years old people	-0,009	-0,009	-0,004	0,008	-0,021	-0,039	-0,002	-0,026	-0,019		0,127**		0,894	1,027	0,872
Number of 55 or more people	-0,002	-0,027	-0,061**	-0,011	-0,084	0,017	0,039	0,072	-0,036		0,120		1,136	0,943	1,056
Only living with his father	-0,062	-0,024	0,218**	-0,027	-0,449	-0,159				0,254	0,118	0,444	4,697	2,550	0,592
Only living with his mother	-0,019	-0,041	-0,091	0,152	0,102	0,120				-0,456	-0,314	-0,144	2,438	0,436**	0,525
Not living with neither the father nor the mother	-0,143**	-0,021	0,051	-0,327**	-0,031	-0,317**				-0,040	0,058	0,011	1,702	0,596	0,265**
Level of poverty	-0,035	0,081**	-0,071				0,209**	0,088	0,113				0,7404	1,414	1,255
Head of household characteristics															
	-0,184**	0,029	-0,247**	-0,081	-3,731	-0,043	0,104	-0,094	-0,077	0,029	0,081	-0,048	0,790	1,058	1,636
Employee ¹		-0,239**	-0,205	0,065	-3,557**	0,439	-0,400**	0,279	-0,546**	-0,085	-0,225	-0,164	40.130*	3,476	0,534
Liberal work ¹	-0,111**	-0,075**	-0,046	-0,138	-0,040	-0,190	-0,163**	0,147	-0,092	-0,164	0,219	-0,205	0,446**	0,625	0,332**
Other jobs ¹	-0,029	0,018	-0,006	-0,043	-0,016	-0,195	-0,141	-0,327	-0,317	0,193	0,669**	0,265	4,849	1,315	0,816
Unemployed / Inactive ¹	-0,137**	0,007	0,056	-0,207	0,0129	-0,221	-0,023	-0,145	0,104	0,044	0,117	0,070	0,289**	1,041	1,161
Geographical characteristics															
Stratum (1) ¹	0,162**	0,005	0,039	0,366**	-0,131	0,070	0,004	0,108	0,120	0,280**	0,069	0,049	1,441	1,048	0,194
Stratum (2) ¹	0,137**	-0,183**	0,106	0,311**	-0,215	0,183	-0,311**	-0,258**	-0,300**	0,341**	0,170	0,264	4,814**	0,835	0,378
Information criterion / Correlations (LR test)	AIC = 935	AIC = 1712	AIC = 940	$\rho_{21} = 0,68** / \rho_{31} = 0,93** / \rho_{32} = 0,58**$			$\rho_{21} = 0,66** / \rho_{31} = 0,90** / \rho_{32} = 0,69**$			$\rho_{21} = 0,74** / \rho_{31} = 0,99** / \rho_{32} = 0,78**$			AIC = 1401	AIC = 3102	AIC = 1496

Indications : **5% signification, *10% signification | Source : Tulane-ENSEA, Enquête sur les conditions de vie et de migration des enfants, estimations on stata |

(1): Binaries variables | (2): CI : Cote d'Ivoire