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Gender and Competition between Child Economic or Non-Economic Labor and Schooling: Evidence from EPAM Mali

Sandrine Aïda KOISSY-KPEIN[1]

[1] *CEPS/INSTEAD - ERDI-Afrilux, Luxembourg*

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Gender and Competition between Child Economic or Non-Economic Labor and Schooling: Evidence from EPAM Mali[1].

Sandrine Aïda KOISSY-KPEIN

ERDI-Afrilux
CEPS/INSTEAD
Differdange-Luxembourg
www.ceps.lu

s.koissy-kpein@ceps.lu

Abstract: This paper uses the Understanding Children's Work (UCW) definition of child labor and data from EPAM Mali to highlight the gender difference in the competition between children's economic or non-economic labor and schooling. A Quadri-variate Probit estimation was first used to account for the interdependency between school and various kinds of child labor: household chores (HHC), market-oriented (MO) activities and non-market-oriented (NMO) activities. Then, a Clogit estimation was used to examine the incidence of time repartition among children within the household regarding the probability of schooling. Empirical results from EPAM Mali provide interesting findings, including differential gender socialization according to the gender of the offspring, gender bias in repartition of tasks and time, and competition between labor activities and schooling.

JEL classification: J16, I21, J20, 012

Key words: Gender, Education, Child-Labor, Intra-household allocations

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1. INTRODUCTION

According to the Platform for Action of the 1995 Beijing Women's Conference, women's contributions to development are seriously underestimated, and thus their social recognition is limited.[2] Women and girl-children contribute to development through a great deal of unremunerated work. On the one hand, women and girl-children participate in the production of goods and services for the market and for household consumption, in agriculture, food production, and family enterprises. Though included in the United Nations System of National Accounts and, therefore, in the international standards for labor statistics, this unremunerated work—particularly that relating to agriculture—is often undervalued and under-recorded. On the other hand, women also still perform the great majority of unremunerated domestic work and community work, such as caring for children and the elderly, preparing meals, protecting the environment, and providing voluntary assistance to vulnerable and disadvantaged individuals and groups. This work is often not measured in quantitative terms and is not valued in national accounts; it can thereby be prejudicial for the women's and girl-children's development and participation in the other activities: labor market participation, schooling, and so forth. This lack of recognition also occurs in the economic literature, in which very few studies look at unremunerated domestic or non-domestic work since, even now, this activity is still perceived as non-economic. Indeed, the economic representation of labor is dominated by the market (and labor is treated as employment) while the market sector rests, in turn, on non-remunerated activities provided in the household.[3] Since the advent of the "new economy of the family,"(Becker, 1981) the economists of human capital have posed the problem of the interaction between activities in the household. However, advances in the analysis or in the recognition of non-remunerated household work remain weak. Concerning the determinants of participation or the effect on the schooling of children, especially for girl-children, very few studies in the prolific literature about schooling and child labor have examined domestic work or household chores.

This paper uses the Understanding Children's Work (UCW) project's definition of labor to analyze how a household's decisions about child labor and investment in children's education interrelate, using data from EPAM Mali. EPAM Mali highlighted the time allocation between leisure, schooling, and labor. The survey was particularly suited to highlight the complexity and diversity of activities undertaken by household members.

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[2] See the United Nations Fourth World Conference on Women: Action for Equality, Development and Peace: http://www.un.org/womenwatch/daw/beijing/platform/economy.htm.

[3] The non-remunerated activities contribute to the maintenance of the labor force (care, meal preparation, and other household chores).

For the study, the co-choice between labor and schooling is considered in the framework of an altruistic model suggested by Basu and Van (1998), where the head decides on the partition of children's time. The authors defined the luxury axiom, which represents the main idea of the altruistic models. According to this model, a household will not push children into the labor market if their income is sufficiently high.

The paper is organized as follows: section 2 provides some findings about the link between child labor and schooling in developing countries; section 3 presents the EPAM surveys and describes the strength of this survey for the analysis and descriptive analyses of data. Assuming simultaneous decision making and interdependence among decisions, I use multivariate Probit models to estimate the co-choice between school and labor activities (Section 4). Section 5 offers a Conditional Logit estimation of schooling participation. I find evidence that *non-economic* domestic activities interfere with schooling and are particularly constraining for girls' schooling.

2. CHILD LABOR AND SCHOOLING IN DEVELOPING COUNTRIES: RELEVANT FINDINGS

There is very well documented literature on the determinants of child labor and its implications for children's development, as well as insightful surveys discussing the findings (Grootaert & Kanbur, 1995; Basu & Tzannatos, 2003; Edmonds & Pavcnik, 2005). Thus this literature review focuses only on the link between child-labor and schooling.

Education and compulsory schooling have historically been considered as major instruments for eradicating child labor. Various authors have noted that the mere availability of good schools can do a lot to divert children away from long hours in the workplace (see, for example, Basu, 1999). Hence governments can intervene to create a variety of incentives, such as more and better schools, giving school meals, and so forth. For instance, Ravallion and Wodon (1999) found that the Bangladesh Food-for-Education program is a strong incentive for school attendance. They concluded that a stipend with a value considerably less than the mean child wage was enough to ensure nearly full school attendance among participants.

Previous research on child labor has revealed a problem of "stark poverty" whereby the parents are obliged to send the children to work for reasons of survival (Basu & Van, 1998; Huebler, 2008). Children's leisure or non-work (especially education) appears as a luxury good in the household's consumption in the sense that a poor household cannot afford to consume this good, but it does so as the household income rises sufficiently. Basu and Van (1998) spoke of the "luxury axiom," and Bhalotra and Heady (2003) revealed a "wealth paradox" to describe the paradoxical observation of a higher incidence of child labor in households that are rich in land and other agricultural assets. They noted that in Ghana and Pakistan, the daughters of land-rich households are more likely to work than the

daughters of land-poor households. In Pakistan, girls' school attendance also decreases according to the ownership of more acreage of farm land. The finding that a larger farm size increases child labor suggests that, at given levels of household income, the return to work relative to the return to school is a significant determinant of child labor, especially among girls.[4]

Some authors have stressed that child labor and schooling are substitutes for one another and that child labor competes with education, especially in poor families. For instance, Ravallion and Wodon (1999) demonstrated how much child labor displaces schooling, and Jensen and Nielsen (1997)assumed that schooling is the reverse of labor. Psacharopoulos (1997) in Bolivia and Venezuela showed that through working, children contribute to household incomes and that the educational attainment of children who work is significantly lower than that of nonworking children. Researchers have generally concluded that the low current incomes of their families keep poor children out of school and perpetuate the poverty into the next generation (Baland & Robinson, 1998).

Other studies have stressed that education and schooling are not mutually exclusive, but have shown that such activities are complementary in the acquisition of survival skills. According to Patrinos and Psacharopoulos (1997), child labor is not detrimental to schooling in Zambia; rather child labor makes it possible for children to go to school. Kruger and Berthelon (2003) found that additional income generated by boys' employment in Nicaragua facilitates their schooling. The importance and possibility of combining school and labor is also found in Grootaert's (1998) study of Côte d'Ivoire. Heady (2000) found a positive relationship between schooling and participation in activities (housework, family farm, and family enterprise) for boys in Ghana. In this study, boys who worked a small amount of time (less than 10 hours per week) on the family farm or other family enterprise were more likely to attend school than those who did not work at all. This result means that expected household income increased the boys' chance of attending school. However, for the same country, Heady noted a positive relationship between school and girls' work on the household farm, but a negative relationship between school and girls' work on household enterprises. Cockburn (2001) and Maitra and Ray (2002) also made explicit observations that children tend to combine school and labor. These results do not detract from the fact that compulsory education can play a role in limiting child labor.

Whatever the link between education and child-labor (whether mutually exclusive or not, for example) child work can be harmful to the development of human capital because it decreases the time spent on study, the probability of attendance at school, the child's performance at school, and an increase in the likelihood that children would drop out of school. The fact that a child is obliged to work has a detrimental effect on the accumulation of human capital and, of course, on the subsequent private and social returns from it (Psacharopoulos, 1997).

The impact of economic activity on children's school performance has been widely studied. Rosati and Rossi (2001) in Pakistan and Nicaragua, Gunnarsson and al. (2006) in eleven Latin American

[4] Such a large effect suggests that efforts to combat child labor may have substantial payoffs in the form of increased future earnings once children become adults.

countries, Patrinos and Psacharopoulos (1999) in Paraguay, Heady (2003) in Ghana, Patrinos and Psacharopoulos (1997) in Peru, and Akabayashi and Psacharopoulos (1999) in Tanzania all showed that child labor significantly reduces school performance. Psacharopoulos (1997) noted, in Bolivia and Venezuela, that child work increases the probability of a failing grade and reduces their educational attainment by one to two years. According to Ray and Lancaster (2005), the negative impact of child labor on school outcomes is more detrimental for girls than for boys.

One aspect of the analysis of education and schooling that has received a lot of attention in recent years is the trade-off for parents in making decisions between child labor and schooling. Education and labor are seen as co-choices, and the two activities are seen as either sequential or simultaneous.[5] Authors who fit into the framework of co-choice analysis generally used bivariate estimation models to examine the interdependence of the joint labor and schooling decision.[6] Authors have also discussed trade-off between activities when factors that tend to increase children's working activities or hours of labor generally tend to decrease their probability of schooling participation or school outcomes (Akabayashi & Psacharopoulos, 1999; Muniz, 2001; Ganglmair, 2006).

Very few studies have been interested in the trade-off that parents face regarding the decision between domestic activities and schooling.[7] The main determinants of children's domestic activities are age and rank between siblings, gender, and parents' work hours.[8] Studies have generally revealed a gender specialization. For instance, Kruger and Berthelon (2007) noted that if pure market work is analyzed, girls are more likely to attend school and less likely to work than boys; but if work includes household chores, girls are more likely to work and less likely to be in school than boys. Edmonds (2006) finds that the oldest girls in a family work 4.2 and 9.8 more times than the second oldest girl in families with four and six children, respectively. Haile and Haile (2007), in studying Ethiopia, showed a gender specialization for co-choice between school and labor: boys are more likely to combine school with market-oriented activities, and girls are more likely to combine school and domestic chores. Kruger and Berthelon (2003) found that in Nicaragua, the presence of pre-school children in the household reduced the probability that girls would attend school, but had no effect for boys. These results show that the type of activity is an important determinant of children's education and labor. In reality, child labor is seen as an important factor of socialization for the future. Khan (2003) concluded that parents assign household work activities due to social norms, and girls have a higher probability of participating in homemaking, compared to boys.

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[5] Depending on the welfare situation of the household, parents decide on the school participation (labor activity) and then send the child to work (to school).

[6] Canagarajah and Coulombe(1997), Nielsen (1998), Muniz (2001) Emerson and Souza (2007), Ganglmair (2006).

[7] Data on housework are difficult to collect. Information may be collected using time-use surveys. The Living Standard Survey Measurement (LSMS) and *Enquêtes permanentes auprès des ménages* (EPAM) provide detailed information about the time used for household activities. Several studies have shown that housework activities tend to be over-reported in questionnaires, suggesting that time spent on these activities is more precisely measured through time-use surveys or time diaries (Guarcello, Lyon, Rosati, & Valdivia, 2007).

[8] For a non-exhaustive list: McHale et al., 1990; Benin and Edwards, 1990; Hilton and Halderman, 1991; Blair, 1992; Antill and al., 1996; Demo and Acock, 1993; Ilahi, 2001. Blair (1992) noted that the participation of girls in housework increases with the mother's hours of employment.

The previous definition of child labor seems debatable, in which “labor” generally refers to market-oriented activities or paid work. It is clear that the allocation of tasks is strongly influenced by gender, and various activities differently affect the participation of girls and boys at school. If child labor concerns only paid work, girls who are withdrawn from school in order to contribute to domestic activity will be considered as "doing nothing," which can strongly bias and underestimate the real consequences of child labor, especially for girls. Scientific studies, especially those based in Latin American countries, have provided evidence of the importance of household chores in the trade-off between labor and schooling. Kruger and Berthelon (2007) noted that if domestic activities are considered, girls are more likely than boys to drop out from school and to dedicate their time exclusively to work; they are also less likely to specialize in school activities. They noted that this effect increases with the amount of time devoted to chores. Levison and Moe (1998) found that better socioeconomic variables reduce both the probability that girls will perform household chores and the number of hours spent on household chores, and increase the number of hours spent on school. In Mexico Levison et al. (2001) found that if only market work is considered, girls are more likely to specialize in schooling relative to boys, but that once household domestic work is included in the definition of work, girls are more likely to specialize in work than are boys. Contreras et al. (2007) estimated bivariate probit regressions on the determinants of market work and school enrollment. The authors found that in Bolivia, market and total work are significant deterrents to school enrollment for all children, and that young boys and girls aged 7 to 14 years are equally likely to be enrolled in school and to be working in the market; but once domestic activities were included in the concept of work, children are just as likely to attend school, but girls are more likely than boys to be working.

This paper uses the UCW definition of child labor to highlight the competition between schooling and various kinds of child labor in Mali. It uses a multivariate estimation to account for the interdependence between school and MO activities, NMO activities, and household chores. In addition to analyzing the co-choice between schooling and labor, the paper investigates the incidence of time repartition on schooling decisions. The aim is to show a gender bias in parents’ decisions.

3. DATA AND DESCRIPTIVE ANALYSIS

EPAM Mali (*Enquêtes Permanente Emploi auprès des Ménages, 2007*) is part of a series of surveys, undertaken since 2000, on the economic activities of households. These surveys highlight behaviors in the labor market, along with formal and informal activities, and give detailed information on labor market participation, unemployment, and labor market income. EPAM 2007 is based on 17,439 individuals and 3,006 households, and it provides detailed information about labor activities, unemployment, job search, the trajectory and perspective of employment, and so forth. The survey is

particularly interesting because it records, for each household member aged 10 years or more, the participation and time used in household activities over seven days.[9]

A wide variety of terms, statistical definitions and measures are employed in the child labor literature. The definition of child labor generally depends on how we define "work" or "labor" (economic or non-economic activities, market or non-market activities, hours, conditions of child work, and so forth); how we define "child" (age); and the quality of statistics available. The International Labor Organization's (ILO) Convention has specified 15 years as the age above which, in normal circumstances, a person may participate in economic activity.[10] Huebler(2008) considered children between 7 and 14 years old to be child laborers, and child labor was defined for all ages as at least one hour of economic activity or 28 hours or more per week in household chores. Emerson and Souza (2007) and Sakellariou and Lall (2000) categorized child labor as working a positive number of hours; and for a separate analysis, they used a more restrictive indicator and looked at children that worked more than 20 hours per week. A child is generally classified as a worker if he is "economically active" (Ashagrie, 1993; Ganglmair, 2006) or if he provides work on a regular basis for which he is remunerated or that results in output destined to the labor market. Muniz (2001) defined waged workers, non-waged workers and domestic workers. The principal difficulty for the analysis of child labor in developing countries is that children work in a variety of settings, not only as wage workers but also as domestic or informal workers. Concerning the definition of domestic activities, more studies that deal with household non-economic activities refer to housework, but rarely define such concepts explicitly. The core of the definitions common to all studies includes housework activities (cleaning, cooking, and so forth). Ilahie (2001) included care of children, the sick, and the elderly; Blair (1992) added maintenance tasks. The definitions and corresponding information can provide very different answers depending on which source we turn to (see for discussion Grootaert and Kanbur, 1995).[11] According to Huebler(2008) the inclusion of household chores in statistics of child labor creates a more accurate measure of the burden of work carried by girls and boys.

Current research by the UCW project, conducted by ILO, UNICEF, and the World Bank, provides a more accurate measure of child labor (Guarcello & al., 2007). The UN international trial classification system is used to identify which activities are economic, falling into the System of National Accounts (SNA) production boundary, and which do not (Appendix 1). I adopted this latter classification, even if the definition of household chores (HHC) as "*non-economic*" activities seems debatable. Thus in this paper labor is defined as follows:

- SNA productive and economic activities, which includes market-oriented (MO) and non-market-oriented (NMO) activities. MO activities are those leading to the production of goods and services

[9] EPAM Mali is particularly interesting since children in developing countries work in a variety of settings, not only in market-oriented activities, but also in various domestic work, informal work, and so forth.

[10] The convention specifies some special cases such as "light work" for an age limit of thirteen and "hazardous work" for an age limit of eighteen (ILO, 1996).

[11] Blair(1992) did not include childcare in his household labor study because this information was not available due to the limitation of data.

that are intended for sale or are sold on the market. NMO activities involve goods produced by the members of the household for their own final consumption, including own-account production of goods and own-account construction and substantial repair services by owners of dwellings. Water and wood collection are included in NMO activities. The production of domestic and personal services for consumption within the same household, such as the preparation of meals, care of children, housekeeping, and so forth, are included within the SNA boundary only if produced by employed paid domestic staff.

- Household chores (HHC) like housekeeping, meal preparation, child care and elderly, and so forth.

The definition of child labor is foundational for the collection of data. The lack of information related to children's housework and their time spent on housework is a considerable problem. In EPAM Mali, a concerted effort has been made for time data collection, especially to collect information that allows for a distinction between HHC, which enter into NMO activities, and the other housework. The individual questionnaire contained a set of questions related to the activities carried out during the last seven days. For the schooling decision the question asked was "Are you currently attending school?" For the work decision, the question for household members older than 10 years was "During the last seven days have you done one or more of the following activities: 1) housekeeping, 2) preparation of meal, 3) collection of wood, 4) collection of water, 5) child care, 6) elder care, 7) repairs and maintenance, 8) social activities with family, 9) associative activities." Information on working hours was collected as the number of hours worked during the last seven days for each activity. The child was considered to be in school if he or she is currently attending school.

Table 1 reports the participation rates of children (between 10 and 18 years old) in school, in SNA activities, and in household chores (HHC). The choice of this categorization for age is debatable when child labor is prohibited for children under 15 years old and for those more than 14 years old; it is probable that most of the children are exclusively on the job market. But this choice also gives information about the education of children beyond primary school, while some of them are drop out. Moreover, younger children's housework is less typed by gender. The repartition of time and tasks among children is more segregated by gender as children become teenagers (Benin & Edwards, 1990; McHale & al., 1990; Hilton & Halderman, 1991; Demo & Acock, 1993; Antill & al., 1996). I intended to make a comparison between boys and girls to check for gender bias. So I defined for a mean comparison test $\Delta\rho$ = mean (boys) – mean (girls), and I tested against the null hypothesis: $H_0 : \text{mean}(\text{boys}) - \text{mean}(\text{girls}) = 0$.

According to descriptive statistics, more than 51% of children are currently attending school. The proportion of boys enrolled at school is higher than the proportion of girls (62% vs. 41%), and the mean comparison test confirms this result. Less than one child out of four devotes himself exclusively to school, and this proportion is higher for boys (30%) than for girls (12%). Concerning labor participation, children are more engaged in SNA activities (64%) than in HHC (52%). The statistics suggest that boys are more SNA-oriented, and girls are more HHC-oriented, since 57% of boys are engaged in SNA activities

(vs. 29% of boys engaged in HHC) and 77% of girls are doing HHC (vs. 71% of girls engaged SNA activities). These proportions vary widely when looking at the kind of activities. Boys are more engaged in MO activities compared to each NMO activity. The proportion of boys engaged in HHC is small; except for the proportion of 20% for housekeeping and 10% for social activities with family, the participation rate of boys does not exceed 5% in activities registered as HHC. Girls, as one might expect it, are more engaged in housekeeping (71%), collection of water (approximately 59%), meal preparation (56%), MO activities (39%), cutting and gathering of woods (27%), and child care (23%). The girls, on average, devote twice as much time to HHC as the boys; Table 1 suggests that girls devote 22 hours per week to HHC, while boys devote 11 hours per week. The mean comparison test suggests that the idea that girls' time spent in HHC is higher than boys' is a hypothesis one cannot reject. On the other hand, the mean comparison tests suggests that the hypothesis that time spent by girls and boys in NMO and MO activities are identical cannot be rejected, at the mean.

The gender comparison of SNA productive and economic activities suggests that the hypothesis that participation of girls is higher than participation of boys cannot be rejected, except for repairs and maintenance, where 19% of boys engaged in this activity vs. 5% of girls. Girls are more engaged in market-oriented activities (39% vs. 34%), in cutting and gathering wood (27% vs. 24%), and in water collection (59% vs. 27%) than boys. As expected, the hypothesis that girls are more engaged in each HHC than boys cannot be rejected, and the most important difference is observed for participation in housekeeping. I performed a chi-square test to check the assumption of independence between the participation in the four activities (school, HHC, MO, and NMO) and the sex of the children. This assumption is rejected at 1%. That means that the reason why a child does HHC is not independent of his gender.

Table 1 also reveals that there is a non-negligible number of children, especially girls, who perform HHC exclusively. According to the statistics, 42% of girls perform HHC exclusively whereas only 11% of boys make HHC exclusively; and the hypothesis that girls' participation is higher than boys one cannot be rejected. The reverse is true for SNA activities exclusively. Statistics suggest that 46% of boys are exclusively engaged in SNA activity and 28.5% of girls exclusively are engaged SNA activities. These results are consistent with studies showing that it is not uncommon for girls to be used as workers in household and boys employed outside the home.

I performed an analysis to consider the repartition of time between children according to their age and sex. Though the difference is quite clear for HHC, where the time devoted to this activity is higher at each age for girls than for boys, and although time increases with age for the girls, whereas time devoted to HHC decreases with age for boys, particularly after 15, the conclusions are less obvious for time in NMO and MO activities. For MO, the time devoted by boys is slightly higher than the time devoted by girls. Between 15 and 16 years of age and after age 17, the graph suggests that girls devote more time than boys to this activity. For NMO activities, the graph suggests that before 13 years of age, and between ages 14 and 16, the time spent is higher for boys than for girls. The difference observed between genders in the repartition of time, especially in HHC, is consistent with the assumption that parents assign chores to children as a socializing experience (Blair, 1992). Indeed, the socialization

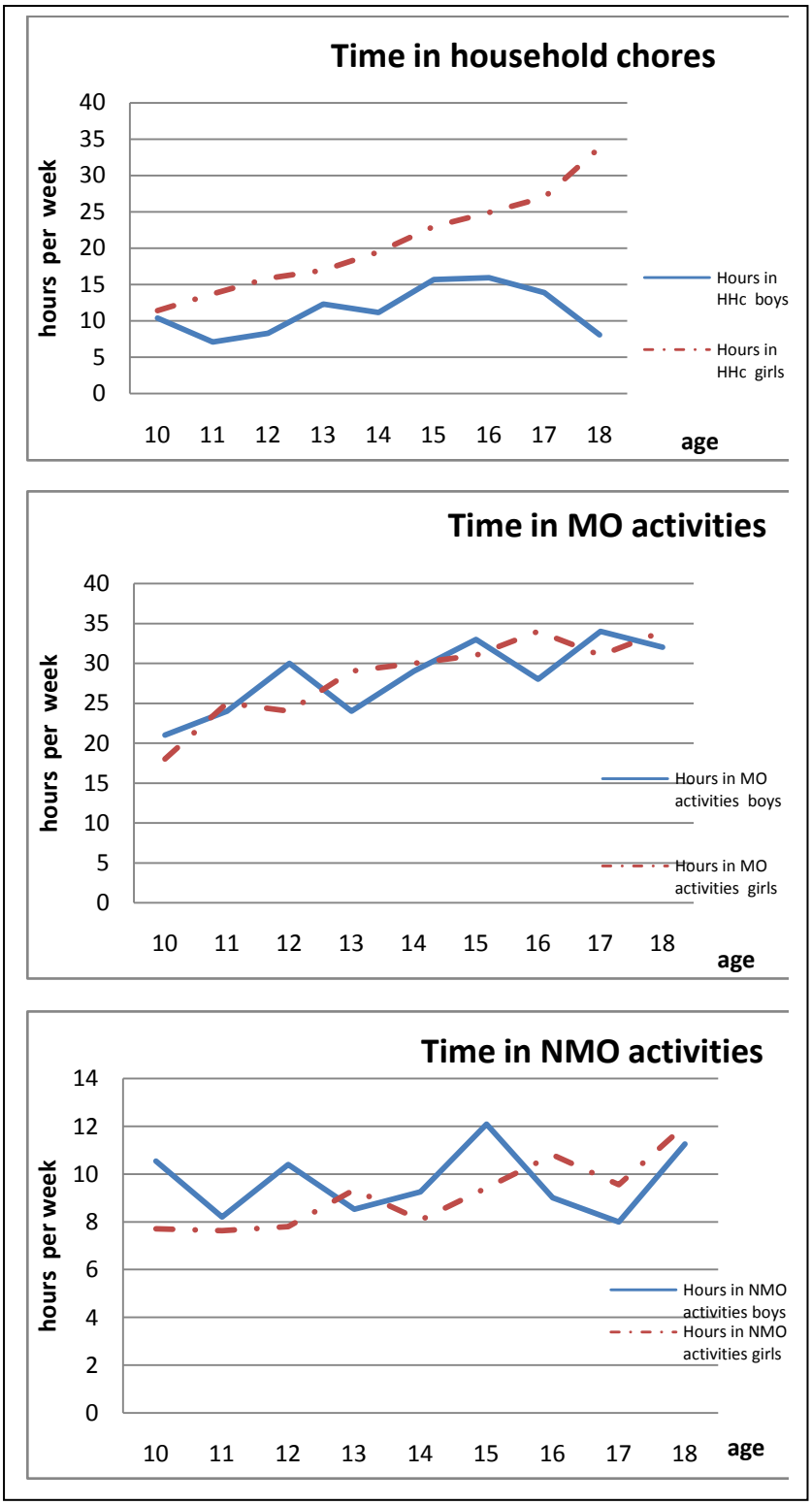
literature emphasizes the commitment of the parents to the growth and development of their children. Children have moved from being "economically useful" to "emotionally priceless," and housework performed by children thus becomes more an educational tool for parents (Blair, 1992).

Table 1. Participation rates of children between 10 and 18 years old in Mali sample

	Children (n=3007)	Boys *(n=1533)*	Girls *(n= 1474)*	Mean comparison test[§] *H0 : mean(boys) – mean(girls) = 0*	
				Ha2::mean(b) – mean(g) ≠ 0	*Conclusion*
School	.5157 (.0091)	.6164 (.0124)	.4111 (.0128)	t = 11.5008 pr = 0.000	We cannot reject the hypothesis that girls' (boys) participation is lower (higher) than boys' (girls').
School exclusively	.2148 (.0074)	.3039 (.0117)	.1221 (.0085)	t = 12.5234 pr = 0.000	We cannot reject the hypothesis that girls' (boys) participation is lower (higher) than boys' (girls').
SNA(productive and economic) activities :	.6401 (.0087)	.5694 (.0126)	.7137 (.0117)	t = -8.3446 pr= 0.000	We cannot reject the hypothesis that girls' (boys) participation is higher (lower) than boys' (girls').
Market oriented (MO)	.3641 (.0087)	.3418 (.0121)	.3873 (.0126)	t = -2.5966 pr = 0.0095	We cannot reject the hypothesis that girls' (boys) participation is higher (lower) than boys' (girls').
*Hours in MO **	34.1987 (.7049)	28.774 (.9856)	30.148 (1.013)	t = -0.9718 pr = 0.3314	We cannot reject HO
Non-market oriented (NMO)	.5380 (.009)	.4507 (.0127)	.6289 (.0125)	t = -9.9583 pr = 0.000	We cannot reject the hypothesis that girls' (boys) participation is higher (lower) than boys' (girls').
Cutting and gathering wood	.2580 (.0079)	.2439 (.0109)	.2727 (.0116)	t = -1.8009 pr = 0.0718	We cannot reject the hypothesis that girls' (boys) participation is higher (lower) than boys' (girls').
Collecting water	.4266 (.0090)	.2713 (.0113)	.588 (.0128)	t = -18.4936 pr= 0.000	We cannot reject the hypothesis that girls' (boys) participation is higher (lower) than boys' (girls').
Repairs and maintenance	.1240 (.006)	.1930 (.010)	.0522 (.0057)	t = 12.1082 pr = 0.000	We cannot reject the hypothesis that girls' (boys) participation is lower (higher) than boys' (girls').
*Hours in NMO **	9.5414 (.281)	9.858 (.407)	9.3052 (.3854)	t = 0.9863 pr = 0.3241	We cannot reject HO
SNA activities exclusively	.4149 (.0130)	.4562 (.0151)	.2848 (.0243)	t = 5.9731 pr = 0.000	We cannot reject the hypothesis that girls' (boys) participation is lower (higher) than boys' (girls').
Household chores[µ] (HHC) :	.5247 (.0091)	.2922 (.011)	.766 (.011)	t = -29.621 pr = 0.000	We cannot reject the hypothesis that girls' (boys) participation is higher (lower) than boys' (girls').
Housekeeping	.4486 (.009)	.200 (.0102)	.7069 (.0118)	t = -32.3564 pr = 0.0000	We cannot reject the hypothesis that girls' (boys) participation is higher (lower) than boys' (girls').
Meal preparation	.2943 (.0117)	.0417 (.0051)	.5569 (.0129)	t = -31.0617 pr= 0.000	We cannot reject the hypothesis that girls' (boys) participation is higher (lower) than boys' (girls').
Child care	.139 (.006)	.045 (.0052)	.2367 (.011)	t = -15.6188	We cannot reject the hypothesis that girls' (boys) participation is higher (lower) than boys' (girls').
Elder care	.0498 (.0039)	.0313 (.0044)	.0691 (.0066)	t = -4.7537 pr = 0.000	We cannot reject the hypothesis that girls' (boys) participation is higher (lower) than boys' (girls').
Social activities with family	.133 (.0061)	.1030 (.007)	.1641 (.0096)	t = -4.9326 pr = 0.000	We cannot reject the hypothesis that girls' (boys) participation is higher (lower) than boys' (girls').
Associative activities	.0405 (.0049)	.033 (.0064)	.046 (.0073)	t = -1.6678 pr= 0.0955	We cannot reject the hypothesis that girls' (boys) participation is higher (lower) than boys' (girls').
*Hours in HHC**	18.90 (.576)	11.051 (.695)	22.016 (.7369)	t = -10.8197 pr= 0.000	We cannot reject the hypothesis that girls' (boys) participation is higher (lower) than boys' (girls').
HHC exclusively	.2273 (.0127)	.1060 (.0119)	.4170 (.0240)	t = -11.5794 pr= 0.000	We cannot reject the hypothesis that girls' (boys) participation is higher (lower) than boys' (girls').

Note § Two-sample t test with unequal variances; µ non SNA (productive but "non economic") activities; *for children who participate.

Research on housework allocation demonstrated that entry into marriage and parenthood induces women and men to perform different kinds or amounts of housework (Cunningham, 2001). Given that the acquisition of knowledge in what is generally assigned to each sex depends on the activity of the adult with the child, parents reinforce gender stereotypes: girls are prepared to stay at home and learn to do future female activities, while boys are less engaged in HHC.



Indeed, girls are more engaged in HHC than in NMO and MO activities, whereas boys are more engaged in NMO, MO, and HHC. Almost half of the boys in the sample engage in exclusively productive and economic activities, while the proportion is two times lower for girls. Conversely, almost half of the girls in the sample do exclusively "non-economic" but productive activities, while the proportion is four times lower for boys. Finally, time devoted to "non-economic" but productive activities increases with age for girls, while it decreases with age for boys.

These findings reveal the difficulties of banning child labor (including HHC); going beyond resource needs of the family, child labor represents an important factor of socialization.

4. QUADRI-VARIATE PROBIT ESTIMATION FOR INTERDEPENDENCE AMONG SCHOOL AND LABOR ACTIVITIES

Ray and Lancaster (2005) chose to analyze the determinant of children's participation in schooling and employment with a multinomial Logit estimation, because this procedure extends bivariate estimation by allowing for more than two possibilities in the outcomes variable. However, Capelleri and Jenkins (2006)provided a multivariate Probit program, which allows for more than two possibilities and assumes simultaneous decision making and interdependence among activities. I used this program and considered a Quadri-variate Probit model for co-choice between schooling and HHC, NMO, and MO activities.

a. QUADRI-VARIATE PROBIT MODEL

Assuming simultaneous decision making and interdependence among child labor activities and child schooling, estimating a joint decisions model seems to be the best empirical strategy.[12] Quadri-variate models allow for jointly estimating a household's co-choice between education and HHC, MO, and NMO activities. To assess whether labor activities affect school participation, I estimated the following four-equation model by simulated maximum likelihood (SML):

$$\begin{cases} Labor_{ik}^{*} = X_i\beta_k + \sum_{\substack{j=3 \\ j\neq k}}^{m} \gamma_j Labor_{ij} + \gamma_1 school_i + \varepsilon_k \;; k = HHC, MO, NMO \\ School_i^{*} = X_i\beta_1 + \sum_{k=2}^{m} \gamma_k Labor_{ik} + \varepsilon_1 \end{cases} \quad (1)$$

$$\text{And} \begin{cases} labor_{ik} = 1 \quad if \quad Labor_{ik}^{*} > 0 \;\; and \;\; labor_{ik} = 0 \;\; otherwise; \; k = HHC, MO, NMO \\ school = 1 \quad if \quad school^{*} > 0 \;\; and \;\; school = 0 \;\; otherwise \end{cases} \quad (2)$$

Where

- X is a vector of exogenous variables and β_k (k=1,k) is a vector of associated parameters;
- ε_{i1}, ε_{im} (m= HHC, MO, NMO) are error terms distributed as a multivariate normal with mean zero and covariance V. The matrix V has unit diagonal elements, and off-diagonal elements are defined by $\rho_{jk} = \rho_{kj.}$

I performed an analysis for all children, boys and girls separately. The estimations were carried out using Stata's mvprobit module of Capellari and Jenkins (2006). The mvprobit command applies the method of SML evaluated and uses the Geweke-Hajivassiliou-Keane (GHK) smooth recursive conditioning simulator to evaluate the multivariate normal distribution. Capellari and Jenkins (2006) state that the simulated

[12] For example, children with higher ability can have a higher probability of going to school and a lower probability of working, which results in a negative correlation between the errors.

probabilities are unbiased, and they bound the correlation coefficient ρ_{jk} within the (0,1) interval. The quadric Probit estimation takes into account the likely correlation between the errors' terms. The estimation of a recursive multivariate probit model requires some consideration for the identification of the model's parameters. Maddala (1983, p. 122) states, for the two equation probit model, that the parameters of the second equation are not identified if there are no exclusion restrictions on the exogenous variables. Wilde (2000) demonstrates that no additional restrictions on the parameters are needed to achieve the identification of the multivariate probit model with an endogenous dummy regressor. Identification requires only the existence of one varying exogenous regressor.

Various tests were considered for this analysis:

a. The first test is to verify whether the decomposition of activities is justified. The decomposition is justified if the determinants of labor participation differ according to labor activities. The test consists in checking the null hypothesis $H_1 : \beta_k = \beta_j ; k \neq j$.

b. Referring to Akabayashi and Psacharopoulos (1999), Muniz (2001), or Ganglmair (2006), the second test is the following trade-off $H_2 : sign\,\beta_1 = sign\,\beta_k$. That is, the respective coefficients in the labor activities and school equations with the same explanatory are of opposite signs. If H_2 is rejected and the sign of the effect of the variable on labor participation is opposite to that of participation at school, then this exogenous factor increases (decreases) the probability of participation in child labor and decreases (increases) the probability of participating in schooling.

c. The correlation coefficient ρ_{jk} is defined as an *unobserved* trade-off or intrinsic competition between activities (labor and schooling). The fourth test consists of checking the null hypothesis of trade-off to be zero, $H_3 : \rho_{Sk} = 0; k = HHC, MO, NMO$. This test also allows us to check the null hypothesis of independence between decisions. The significance mean that the non-explained component (residual) related to the fact of the child's attendance (or not) at school is linked to the non-explained component of the working decision. Nielsen (1998) interprets the correlation coefficient ρ as the extent to which school attendance decreases (increases) as a result of an increase (decrease) in the labor due to an unobserved factor. Ganglmair (2006) says that the correlation coefficient represents the degree to which the parents decide in favor of labor against school and vice versa.

d. The third test consists of checking the gender differences between the determinants of child labor and schooling; a gender difference in competition between co-choices: $H_4 : \beta_g = \beta_b$.
If the hypothesis is rejected, that means that repartition of time between children is gendered.

The paper is based on children between 10 and 18 years old. The variables that can affect the co-choice between school and labor are as follows:

- Characteristics of children: age, sex (girl = 1), children of the household head

- Characteristics of household: status (polygamous = 1), residence (urban = 1), number of head's children, proportion of girls among the children of the head.
    - Head characteristics: gender (female =1), education, labor income (principal and secondary activities).[13]
    - I also introduced an exogenous variable for the presence of an employed paid domestic in the HHC equation; an exogenous variable for the household head's profession (farmer =1) in the MO equation; and an exogenous variable for the number of females (other than child and spouses of the household head and household head itself) more than 12 years old in the NMO equation.

b. RESULTS AND DISCUSSION

Tables 2 and 5 report the Quadri-variate Probit results for child labor and school participation. Basic results reveal that boys have a higher probability than girls to go to school.

The proportion of girls among the household head children also increases the probability of a boy's schooling. Although the results do not allow not rejecting gender bias in participation in MO activities, girls have a higher probability than boys to do NMO activities or HHC. The children in urban areas have a higher probability of going to school than children in rural areas and a lower probability of working. This result is confirmed for each kind of labor activity (MO, NMO, and HHC), except for HHC for boys.[14] Similarly, children of the household head have a higher probability than the others to go to school, and a lower probability to engage in labor. The results suggest that having a female household head increases the probability of school participation, but also increases the probability of MO activities, especially for boys. This result probably reflects the fact that households headed by females are poorer. The component that the female household head generally captures is gender vulnerability to poverty. According to Ray (2000), female-headed households are more vulnerable to poverty and are more dependent on children's earnings and child labor than are male-headed households. Ray and Lancaster (2005) also noted that children in female-headed households and in households with low levels of adult education tend to perform worse than other children. Psacharopoulos (1997) also found that the probability of a working child is higher in female-headed households in Bolivia. On the other hand, Canagarajah and Coulombe (1997) found that children from female-headed households have a higher probability of going to school in Ghana. Maitra and Ray (2000) found in Pakistan that the gender of the head of household does not matter in the schooling decision of children.

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[13] Originally conducted to provide information about labor activity in Mali, EPAM does not provide any information about assets, property, household expenses, or other information to measure household wealth. Collecting data on the household head's labor income was the only way to provide information about the wealth of the household; and I know that this measure is very debatable. Taking into account the fact that the objective of this paper is to compare competition between various labor activities and schooling, I do not think that this form of household wealth can have a great influence on the coefficient of correlation. Thus the survey provides qualitative variables in the form of income classified into nine intervals, from none up to SMIC at above 500,000 a month. In the form that it is used, household head income represents a categorical (ordinal) variable from 0 at 9. Note that education variables can capture a substantial part of the income effect due to the correlation between the two variables.

[14] This result is probably due to the lower participation of boys, or to the fact that difference in participation between areas is not significant for boys in HHC.

For Brazil, Muniz (2001) found instead that female household heads in Brazil are less likely to send their children to school and more likely to send them to waged work. Khan (2003) found in Pakistan that children from male-headed households have a lower probability of going to school and a higher probability of working. He concluded that despite the lower socioeconomic status of female heads, they are good household managers regarding children's education. Huebler (2008) found that children with a female head of household have a higher probability of being in school but a lower probability of working.

The results also suggest that the household head is adverse (disutility) to his own daughters' labor, although only the girls of the household head have a decreased probability of working in MO, NMO or HHC. The level of education of the household head is also an increasing component of participation at school, except for girls, where results suggest that education of the head has a significant and positive impact on school participation when the household head has at least a secondary education.

Results suggest for education that the schooling of girls (but not boys) increases with an additional secondary income of the household head. This latter result confirms the hypothesis that girls' schooling is more constrained by the household wealth than the education of boys (Appleton, 1995; Lavy, 1996; Glick & Sahn, 2000). The "luxury axiom" suggests that there is a critical wage such that the household will push its children to work if, and only if, the adult wages prevailing in the market are less than the critical wage. This implies that household wealth is a decreasing component of children labor. The effects of the household head incomes in the estimations go against the "luxury axiom"; labor participation of boys increases, in all the activities, with secondary income for the head, and the MO activity of girls increases with the head's labor income. Bhalotra and Heady (2003) used the term *wealth paradox* to describe the initially paradoxical observation of a higher incidence of child labor in households that are rich in land and other agricultural assets, shedding new light on the poverty explanation. Note also that the choice of the labor income, like the household wealth indicator, is debatable. Finally, results suggest that the presence of the domestic in a household and the number of females of more than 12 years old are components that decrease HHC and NMO participation, respectively. The farmer household head is an increasing component of the MO participation.

Concerning the first hypothesis about differences in determinants of labor activities' participation, the results confirm the adopted classification (definition) of child labor since determinants of child labor are not the same according to the kind of tasks provides by children. For each sample, I used a Wald test on key variables (urban, for example) and for all the explanatory variables. Indeed the results of the Wald tests in Table 3 suggest that the null hypothesis (H_1) of equality of coefficient is rejected for all pairs. The tests confirm that determinants of labor are different according to the kind of activities. Table 2 suggests that the effect of age is not the same according to the labor equation. When looking at the estimation for all the samples, the effect of age is non-significant for HHC for children, while the participation in MO decreases, then increases, and then decreases again with age; and the participation in NMO increases with the age of the children. Concerning the component "sex" (girl=1), the results suggest a significance in all the estimations of labor participation, except for MO activities.

The results also suggest that the number of the head's children is a decreasing component for HHC and MO participation, while this component is non-significant for NMO. The status of the household (polygamous =1) is an increasing component for MO activities only.

Table 2. Quadri-variate Probit for co-choice between HHC, MO, and NMO and schooling

Variables	**HHC**		**MO**		**NMO**		**Schc**	
	Coef	**Z**	**Coef**	**Z**	**Coef**	**Z**	**Coef**	**Z**
Age	0,889	0.88	-2,940	-2.63$	0,033	3.38$	2,425	2.15**
$Age^2/100$	-6,236	-0.85	22,302	2.74$			-18,113	-2.21**
$Age^3/1000$	156,180	0.89	-529,892	-2.74$			420,838	2.15**
Girl	1,254	23.34$	0,051	0.97	0,533	10.25$	-0,519	-9.80$
Child of HH head	-0,303	-4.53$	-0,123	-1.85*	-0,120	-1.79*	0,623	9.20$
Number of head children	-0,026	-2.65$	-0,034	-3.43$	-0,004	-0.44	0,006	0.60
Proportion of girls	0,045	0.49	-0,076	-0.86	-0,077	-0.89	0,371	4.02$
Urban	-0,209	-3.46$	-0,692	-10.33$	-0,683	-11.94$	0,828	13.65$
Female HH head	-0,107	-1.12	0,225	2.39**	-0,044	-0.47	0,292	3.01$
Polygamous HH	0,018	0.30	0,138	2.38**	0,020	0.34	-0,051	-0.89
Head primary education	0,215	2.04**	0,217	2.18**	0,096	0.98	0,293	2.80$
Head secondary education	-0,162	-2.44**	-0,055	-0.77	-0,345	-5.35$	0,523	7.58$
Head higher education	-0,386	-2.88$	0,128	0.91	-1,023	-6.42$	0,520	3.85$
Head income, principal labor	0,002	0.18	0,015	1.09	0,004	0.34	0,006	0.47
Head income, secondary labor	0,033	1.37	0,062	2.63$	0,015	0.66	0,050	2.10**
Head farmer			0,409	7.12$				
Number of females (> 12 years old)					-0,045	-1.88*		
Domestic in the HH	-0,474	-3.02$						
Constant	-4,595	-1.01	11,768	2.34**	-0,114	-0.70	-10,805	-2.14**
Rho_{MO_HHC}	0,319	9.71$						
Rho_{NMO_HHC}	0,709	34.47$						
Rho_{S_HHC}	-0,304	-9.60$						
Rho_{NMO_MO}	0,309	10.23$						
Rho_{S_MO}	-0,535	-20.51$						
Rho_{S_NMO}	-0,206	-6.64$						
Obs.								3007
Log pseudolikelihood							χ^2= -6268.0745	Pr = 0.0000
Wald chi2								1961.73
Likelihood ratio test of rho21 = rho31 = rho41 = rho32 = rho42 = rho43 = 0: χ^2= 1069.5 Pr = 0.0000 Multivariate probit (SML, # draws = 55)								

Note: $ significant at 1%level, ** significant at 5%level, * significant at 10% level

The breakdown of activities according to UCW reveals that it is more interesting and more informative to consider MO activities, NMO activities, and HHC separately.

Table 3. Wald test of comparison of coefficient among child labor activities

		Children	Boys	Girls
Test [HHC=MO=NMO] girl	X^2	354.82		
	pvalue	0.000		
Test [HHC=MO=NMO] urban	X^2	72.06	45.86	33.01
	pvalue	0.000	0.000	0.000
Test [HHC=MO=NMO] for all explanatory variables	X^2	583.23	129.65	191.67
	pvalue	0.0000	0.000	0.000

Akabayashi and Psacharopoulos (1999) have talked about an *observed* trade-off when a change in an exogenous factor increases child labor participation and decreases (at the same time) school participation[15].

Concerning the *observed* trade-off, the results suggest that the null hypothesis of no observed trade-off in equation (H_2) can be rejected for the entire sample:

- In the co-choice between HHC and schooling for sex, child of the household head, number of household head children, urban area, female household head, polygamous household, head secondary and higher education.
- In the co-choice between MO and schooling for age, sex, child of the household head, number of household head children, proportion of girls among the children of the household head, urban area, polygamous household, head secondary education.
- In the co-choice between NMO and schooling for sex, child of the household head, number of household head children, proportion of girls among the children of the household head, urban area, female household head, polygamous household, head secondary and higher education.

The main result suggests that boys (girls) have an increased (decreased) probability to go to school and a decreased (increased) probability to make labor activities.

Concerning *unobserved* trade-off or intrinsic competition between schooling and NMO activities, MO activities, and HHC, Table 4 shows the correlation coefficient from the Quadri-variate Probit estimations. The null hypothesis of independence between schooling decisions and labor participation of children ($\mathrm{H}_3 : \rho_{Sm} = 0; m = HHC, MO, NMO$) can be rejected for MO activities, NMO activities, and HHC for children, both boys and girls. The correlation coefficient, which is significantly

[15] Authors have talked about an overall trade-off between working and studying when, for almost all exogenous variables, the signs of the marginal effects on working hours are opposite to those of the hours of study. In that sense, no variable is found to increase both working and studying significantly at the same time.

negative (at 1%) in all the estimations, implies that the decisions of schooling and labor are made in an interdependent way and can be analyzed as co-choices. School attendance decreases as a result of an increase in labor participation due to unobserved factors. The reason that the child does not go to school is not independent of his labor contribution at home. According to previous papers, a higher value for ρ is equivalent to a stronger trade-off between the two decisions' interests.

Table 4. Coefficient of unobserved trade-off among school and labor

Co-choice schooling-	Sample	ρ	z
HHC	Children	-0,304	-9.05
	Boys	-0,269	-6.21
	Girls	-0,324	-6.76
MO activities	Children	-0,535	-21.08
	Boys	-0,496	-12.9
	Girls	-0,577	-15.8
NMO activities	Children	-0,206	-6.29
	Boys	-0,216	-5.05
	Girls	-0,198	-4.14

For all children, boys and girls, the trade-off coefficients reveal a stronger competition for co-choice between MO activities and schooling, following the co-choice between HHC activities and schooling, and then the co-choice between NMO activities and schooling. We can say that NMO activities are less constraining (restrictive) than HHC, which are in turn less constraining than MO activities. Muniz (2001) found that trade-off between work and study is much larger in waged tasks than in non-waged.[16]

Although this is not the object of this study, the results also suggest a correlation between the different labor activities: the correlation coefficients between HHC and MO, MO and NMO, and HHC and NMO are significant but positive. The null hypothesis of independence between labor activities can be rejected. This result suggests that a labor contribution increases as the result of an increase of another labor contribution due to unobserved factors.

Finally, concerning gender bias (Table 5), the results reveal differences among determinants of activities. Consistent with descriptive statistics, age is an increasing component of HHC participation for girls, whereas for boys, participation increases and then decreases with age, the rate of decrease becoming less with age. For MO activities, boys' participation increases with age; for girls, the participation decreases and then increases with age, the rate of increase becoming less with age. For

[16] The correlation coefficient is difficult to interpret since the value also depends on the omitted variable. So I refer only to the interpretation that the reason why the child does not go to school is not independent of his labor contribution at home.

schooling, boys' participation decreases with age, while for girls, the participation increases and then decreases with age.

The results suggest that only the girls of the household head have a decreasing probability of working (NMO, MO, HHC), and the component is not significant for boys. In the same way, living in an urban area is a decreasing component for HHC, through the component is not significant for boys' contribution to HHC. A female household head is an increasing component for boys' participation in MO activities, while the component is not significant for girls. Girls in polygamous households have a higher probability of engaging in MO activities, but the component is not significant for boys. Empirical studies have generally shown the significant impact of gender composition of siblings on the education of girls and boys (see Barnet-Verzat & Wolff , 2003, for a review of literature). For example, Butcher and Case (1994) noted that for women with a large number of brothers, the level of education is more important than for others. The quantity-quality model (Becker and Lewis , 1973; Becker and Tomes , 1976, 1986; Becker , 1991) suggests that children (girls and boys) with sisters are in a better situation than children with brothers. Garg and Morduch (1998) and Morduch (2000) confirmed these predictions for Tanzania and Ghana. The results for EPAM Mali do not necessarily confirm these predictions. The proportion of girls among the head of household's children is an increasing component only for boys' participation at school. The results also confirm a difference concerning head education and head income. Finally, the results suggest that the presence of the domestic in a household and the number of females more than 12 years old are decreasing components of HHC and NMO participation, respectively. This latter result confirms the gender difference in the repartition of time and tasks.

Table 5 Quadri-variate Probit for co-choice between HHC, MO, NMO and schooling: Sub-sample of boys and girls.

	Boys (n=1533)								**Girls** (n=1474)							
Variables	**HHC**		**MO**		**NMO**		**Schc**		**HHC**		**MO**		**NMO**		**Schc**	
	Coef	**Z**	**Coef**	**Z**	**Coef**	**Z**	**Coef**	**Z**	**Coef**	**Z**	**Coef**	**Z**	**Coef**	**Z**	**Coef**	**Z**
Age	2,419	1.73*	0,120	8.35$	0,025	1.93**	0,195	1.30	0,117	7.47$	-4,99	-3.14$	0,035	2.34**	3,206	1.95**
$Age^2/100$	-17,86	-1.75*					-1,038	-1.94**			37,23	3.23$			-24,563	-2.05**
$Age^3/1000$	438,7	1.80*									-884,1	-3.23$			588,22	2.06**
Child of HH head	-0,068	-0.69	0,083	0.78	0,117	1.19	0,243	2.39**	-0,532	-4.84$	-0,28	-2.87$	-0,296	-2.83$	1,065	9.79$
Number of head's children	-0,031	-2.20**	-0,031	-2.12**	-0,006	-0.45	-0,002	-0.11	-0,012	-0.80	-0,039	-2.74$	0,003	0.17	-0,005	-0.33
Proportion of girls	0,106	0.75	-0,138	-0.96	-0,008	-0.06	0,523	3.50$	0,197	1.40	0,107	0.88	-0,045	-0.36	-0,063	-0.46
Urban	-0,066	-0.81	-0,769	-7.88$	-0,534	-6.75$	0,898	10.3$	-0,390	-4.34$	-0,617	-6.52$	-0,857	-10.27$	0,785	8.85$
Female HH head	-0,035	-0.28	0,255	1.97**	0,000	-0.00	0,247	1.91**	-0,191	-1.38	0,177	1.25	-0,061	-0.45	0,359	2.48$
Polygamous HH	0,017	0.21	0,128	1.57	0,048	0.63	-0,023	-0.29	0,040	0.47	0,135	1.61*	-0,001	-0.01	-0,062	-0.71
Head, primary education	0,234	1.73*	0,133	0.97	0,202	1.56	0,558	3.81$	0,235	1.46	0,303	2.05**	-0,001	-0.01	-0,061	-0.38
Head, secondary education	-0,283	-2.93$	-0,030	-0.30	-0,354	-3.85$	0,608	5.93$	-0,005	-0.05	-0,097	-0.97	-0,306	-3.30$	0,480	4.80$
Head, higher education	-0,234	-1.23	-0,745	-2.52**	-0,812	-3.59$	1,047	4.04$	-0,397	-2.30**	0,465	2.60$	-1,058	-5.05$	0,286	1.54
Head income of 1^{rst} labor	0,002	0.09	0,004	0.18	-0,009	-0.51	0,024	1.24	-0,002	-0.10	0,025	1.30	0,018	0.96	-0,005	-0.24
Head income of 2^{nd} labor	0,078	2.62$	0,061	1.93**	0,054	1.82*	0,030	0.99	-0,024	-0.69	0,073	2.05**	-0,032	-0.90	0,061	1.68*
Head farmer			0,457	5.55$	0,014						0,355	4.35$				
Number of Females (> 12 years of age)					-0,305	0.39							-0,092	-3.13$		
Domestic in the HH	-0,490	-0.81							-0,601	-3.33$						
Constant	-11,26	-1.79*	-2,027	-8.16$	0,117	-1.40	-1,243	-1.21	-0,352	-1.39	21,016	2.93$	0,561	2.24**	-14,210	-1.93**
Rho_{MO_HHC}	0,254	5.79$							0,402	8.21$						
Rho_{NMO_HHC}	0,646	21.2$							0,774	29.0$						
Rho_{S_HHC}	-0,269	-6.21$							-0,324	-6.76$						
Rho_{NMO_MO}	0,358	8.79$							0,281	6.12$						
Rho_{S_MO}	-0,496	-12.9$							-0,577	-15.8$						
Rho_{S_NMO}	-0,216	-5.05$							-0,198	-4.14$						
Log pseudolikelihood	χ^2= -3331.7622 Pr = 0.0000								χ^2= -2832.2 pr= 0.0000							
Wald chi2	558.91								898.51							
Likelihood ratio test of rho21 = rho31 = rho41 = rho32 = rho42 = rho43 = 0: χ^2= 483.307Pr = 0.000									Likelihood ratio test of rho21 = rho31 = rho41 = rho32 = rho42 = rho43 = 0: χ^2= 587.495 Pr = 0.00							

Note: $ significant at 1%level, ** significant at 5%level, * significant at 10% level

5. CLOGIT ESTIMATION FOR THE REGRESSION OF SCHOOL PARTICIPATION UNDER TIME SPENT IN LABOR ACTIVITIES

a. PRESENTATION

The aim of this section is to examine how the repartition of time between children within the household affects the participation at school of a given child. Let's suppose that:

$$school_i^* = X_i\beta_1 + T\_HHC_i\beta_2 + T\_MO_i\beta_3 + T\_NMO_i\beta_4 + \varepsilon_i \qquad (3)$$

where T_HHC_i, T_MO_i, T_NMO_i represent time devoted respectively to HHC, MO, NMO, and X_i observable characteristics, and i is the index of the child. Equation (3) cannot be estimated consistently while omitting unobserved individual (for example, ability and parents' preferences) and household specific effects from the regression. Therefore, I controlled for individual-specific unobserved heterogeneity using Chamberlain's fixed effects Logit model (Chamberlain , 1980). The model enables control for family specific effects and gives an effective representation of the family background. The model is attractive because it avoids the correction by instrumental variables methods, especially since in practice it can be difficult to obtain a valid instrument.

I transformed the data in the panel by defining $school_{if}$ (T_HHC_{if}, T_MO_{if}, T_NMO_{if}) for the school participation (respectively, time devoted to HHC, MO, NMO) of child i in the family f. By assuming that the unobserved household specific effect is constant across siblings, the unobserved household specific effects are eliminated. In the likelihood function, explanatory variables that do not vary within the unit cancel out. Also, the algorithm eliminated households in which all the children are enrolled or all the children are not enrolled. The fixed effect Logit estimator of β_k gives the effect of each explanatory variable on the log-odds ratio. The independent variables defined for the analysis are as follows: age, child of the household head, class for hours in activities (less than 7 hours a week, between 7 and 14 hours a week, more than 14 hours a week), and interaction terms for girls' time in labor activities.

b. RESULTS AND DISCUSSION

Table 6 presents the results of the Clogit estimation of participation at school. The results suggest that hours in MO activities have a significant and negative impact on the probability of school participation when children provide more than 7 hours per week or one hour a day.

Table 6. Clogit estimation for participation at school

	Coef.	z
age	-0,239	-5.90$
Enfant du chef	1,435	4.45$
Hours in NMO [7 -14 [	-0,226	-0.56
Hours in HHC [7 -14 [	-0,102	-0.13
Hours in MO [7 -14 [	-2,212	-2.81$
Hours in NMO >14	-1,152	-1.79$
Hours in HHC >14	-0,451	-0.92
Hours in MO >14	-1,413	-4.03$
Interaction		
Girl * Hours in NMO [7 -14 [	-0,318	-0.48
Girl * Hours in HHC [7 -14 [	-1,366	-1.73*
Girl * Hours in MO [7 -14 [	-0,128	-0.12
Girl * Hours in NMO >14	0,674	0.72
Girl * Hours in HHC >14	-1,140	-2.09**
Girl * Hours in MO >14	-0,954	-2.05**
Observations 1040 Wald chi2 125.90 pr 0.000 Log pseudolikelihood = -236.35547 Pseudo R2 = 0.3854 Note $ significant at 1% level, **5% level, * 10%level		

Similarly, hours in NMO activities have a significant and negative impact on the probability of school participation when children provide more than 14 hours per week, or 2 hours a day. The time spend in HHC has a negative, but not significant, effect. This result may be due to composition effect, given the gender difference observed in the descriptive analysis. Regarding the interaction terms, the results suggest that girls have a lower probability of going to school when they provide at least 7 hours of HHC per week and 14 hours of MO activities per week. These results confirm that contribution to HHC is restrictive for girls' education, the same as involvement in the labor market. Kruger and Berthelot (2007) also noted in Brazil that any amount of time dedicated to domestic work is a deterrent to girls' human capital accumulation and that this harmful effect is greater the more time that they spend on household duties. Their findings revealed that even a small amount of time dedicated to domestic chores may be enough to cause young Brazilian girls to drop out of school.

6. CONCLUSION

This paper uses the UCW project definition of child labor and EPAM Mali 2007 to analyze the gender difference in the co-choice between child labor and schooling. A Quadri-variate estimation is used to highlight the interdependence and the trade-off between school and child labor, and a Clogit regression is used to show how the repartition of time among children within the household affects participation at school. The differences observed in the determinants of labor suggest that it is more interesting and informative to consider MO activities, NMO activities and HHC separately. The results first give evidence of an observed trade-off, which is the case if the independent variables' effect on a child's labor force participation is opposite to their effect on school participation. In the same way, there is an intrinsic competition (or *unobserved* trade-off) between schooling and HHC, MO, and NMO activities. The competition between school and HHC, MO, and NMO activities reveals that the reason why children do not go to school is not independent of the repartition of time and labor at home. Concerning gender differences, girl-children (boy-children) have a lower (higher) probability of going to school and a higher (lower) probability of working. Better yet, girls have a higher probability to do HHC. They devote a mean of 22 hours per week of HHC (vs. half that time for boys); and the time spent in this activity increases with age for girls, whereas the time devoted decreases with age for boys.

The repartition of time and tasks among children is segregated by gender and time in HHC, a type of labor that has been invisible to analysts and economists and generally neglected in the literature of child-labor, and it is harmful for girls' schooling.

This analysis also confirms the differential gender socialization of children. Boys in the sample were more engaged in productive and economic activities, while girls were more engaged in HHC. Almost half of the boys did exclusively productive and economic activities while the proportion was two times lower for girls. Conversely, almost half the girls in the sample engaged in exclusively "non-economic" but productive activities, while the proportion was four times lower for boys. It seems that parents encourage the gender division of tasks as girls and boys are engaged in different labors. Girls are generally prepared for their role in their own future homes. These results reveal the difficulties for policy makers since child-labor, at least in part, refers to child-socialization. Promoting women's employment and wages in the labor market could be a way to promote girls' schooling.

This analysis can be extended by considering the bargaining process between school decisions and labor—in which fathers and mothers decide on the allocation of time (labor market or/and to school) among children—and by exploring the possibility of an extra household gender bias in this decision. For this, the information on the EPAM survey may be completed by providing information on women's empowerment and information that allows the researcher to match children with their mothers.

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B.P. 48
L-4501 Differdange
Tél.: +352 58.58.55-801
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