Working or Schooling:
What Determine Children's
Time Allocation in Senegal ?[*]

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ABSTRACT

This paper examines the empirical evidence underlying Senegalese household decision making on children occupations. Using household survey data we test the impact of household and individual characteristics on children activities, focusing on three mutually exclusive ones: school, housework and work. The originality of this paper is to highlight the importance of the opportunity costs of schooling (proxied by the presence of basic and facilities) on children activities. The paper also investigates the impact of female bargaining power on children activities. Such a power affects positively and significantly children schooling with a noteworthy gender bias favorable to boys.

1. Introduction

It is increasingly admitted that building new schools, improving school quality or subsidizing schooling are not sufficient to improve school attendance and/or curb child labor. If one aims at attaining these objectives, it is also important to understand what affects parents' decision to send their children to school or to work. A number of previous studies have investigated the relationship between households' decisions and children activities, with mixed conclusions. Findings on this issue likely vary across countries.

This paper examines the empirical evidence underlying Senegalese household decision making of whether to send children to work or school. The aim is to identify the key determinants of children's activities in Senegal. Interest in this issue is twofold. First, it is widely admitted that a low level of human capital constitutes an impediment to economic growth. Improving human capital stock is thus a key condition for developing countries in order to address the growth challenge. Second, Senegal is committed to meet the Millennium

Development Goals by 2015 (see UN, 2003). However, the trend towards these goals does not look optimistic. The 2000 MICS survey (DPS, 2000) indicates that primary-school enrolment rates are still modest: 53.9 % for boys and 44.6 % for girls. Meantime, about 40 % of boys and 35 % girls aged 5-15 are economically active. This survey indicates furthermore that children are often precociously engaged in the labor market. It is evidenced that about one-third (31 %) of working children in Senegal are less than 10 years old.

The households in which they live determine the ways children spend their time. Households, through an internal mechanism, allocate time for different activities among their members, and also allocate resources between themselves for consumption, saving and investment including human capital formation. Therefore, within that context, children's activities depend heavily on factors that affect household's constraints, opportunities and incentives. Whether children will go to school or not depends on the extent to which households require their labor to achieve some level of welfare.

Theoretical explanations have been given on how households decide children's participation in schooling and labor activities. Basu and Van (1998) state that child participation in work activities occurs under the conditions of multiplicity of equilibriums in the labor market. In a one-period model, they show that the type of activities that households choose for their children are part of any of two stable equilibriums : a high-wage equilibrium in which children do not work and a low-wage one in which both adults and children do. Basu and Van derive their conclusion from two axioms: the *substitution axiom* which postulates that child and adult labor are perfect substitutes and the *luxury axiom* which states that the household chooses not to send children to work if household income from non-child source is high enough.

Baland and Robinson (2000) also studied households' decision mechanism of whether to send child to work or to school. In a two-period model taking into account the future returns from investment in children education, they demonstrate that parents will choose a socially efficient level of child labor if they are not subject to borrowing constraints or if they can make a bequest or receive a transfer from their children. But, if parents lack access to the credit market or if there is neither transfer nor bequest possibility, they will engage their children in the labor market at an inefficiently high level. Baland-Robinson setting with two-sided altruism is used by Rogers and Swinnerton (2004) who highlight the relation between children outcomes and the level of parental income. Their main finding is that a rise in parental income does not always lead to a decrease in child labor.

Rogers-Swinnerton's finding suggests that the relationship between child labor and parental income is not monotonic. That result is non-consistent with the luxury axiom. However, it is supported by some empirical work, which demonstrate that the link between child labor and poverty is weak. Ray (2000) and Maitra and Ray (2000) show in a comparative study that the effects of household poverty on children activities are not similar across countries. They find that the relationships between child labor and household poverty and between child schooling and household poverty are indeed strongly confirmed by Pakistani data. In contrast, such relationships are much weaker in Peru and in Ghana. Even in the Peruvian case, data fail to detect any significant association between household poverty and child activities. They also find that the impact of adult wages on child activities differs across these countries. Changes in adult wages have a larger impact in Pakistan than in Peru or in Ghana. Cockburn (2001) also casts nuances on the relationship between household welfare and child labor or schooling decisions (see also Ravallion and Wodon, 2000; Canagarajah and Coulombe, 1997). He argues that such a relation depends considerably on child labor returns and on the composition of household asset portfolios. Using multinomial analysis of data from rural Ethiopian households, he demonstrates that different physical assets have different effects on child labor supply according to their degree of substitution. For instance, increasing access to physical assets that require relatively more child work, such as small animals, will tend to increase children's amount of work and reduce their schooling and leisure.

The children's time allocation may also depend on the access to basic services such as water and electricity. The presence of such services in the household decreases the opportunity cost of schooling as children are freed from the responsibility fetching water and/or collecting wood or charcoal for lighting or cooking. The presence of these services is thus likely to

decrease the opportunity cost of schooling, and the policy implication is straightforward. The expansion of basic services and facilities could be used in developing countries as an instrument for reducing child labor and increasing school attendance. Literature on child labor is quite scarce about this subject. Guarcello and al (2004) analyze the impact of the presence of basic services (e.g. water and electricity) on child labor in five developing countries (El Salvador, Ghana, Guatemala, Morocco and Yemen). Their main finding is that households having access to water and electricity are more likely to send their children to school. Furthermore, Cockburn (2001) has found that the distance from the nearest source of water reduces school attendance among girls in rural Ethiopia.

There are also theoretical and empirical studies that emphasize the role of gender balance of power within the household on children activities. The basic idea underlying such an approach is that men and women may have different preferences. Thus, depending on the balance power between them, the household may choose differently. Basu (2001) and Basu and Ray (2001) show that children are less likely to work in households where power is well balanced between the husband and the wife. Their main finding is that the relationship between women's relative power and child labor is not monotonic and follows an U-shape. In other words, as women's power rises, child labor initially falls but beyond a certain point (too much power to the women), it rises again.

Total household income or gender balance of power are not the unique factors that could affect children activities. Recent empirical work has identified other important factors that are worth being studied. In particular, households' socio-economics characteristics (living arrangements, living areas, adults employment and educational attainment) and children characteristics (age, gender, birth order; etc) are pointed as very determinants on children's time use.

In this paper, we postulate that children's activities in Senegal depend on the level of household income, household characteristics, the availability of basic services such as access to drinkable water or electricity, and on women's relative power within households. As a proxy of women's power, we use their share of adult total income. We distinguish three types of mutually exclusive activities in which children are engaged: attending school, doing housework or working. One caveat to this option is that children activities are not always mutually exclusive. Children can be jointly engaged in two or three activities at a same time (Maitra and Ray, 2000). Nevertheless, we rule out such an eventuality for two reasons. First, as in many household surveys, the database we use does not allow to determine whether children combine two or more activities. Second, we focus only on children main activity - meaning the activity in which they devote the most important part of their time.

Our estimation framework consists of a multinomial logit model. Such a model is largely used in the literature and allows to jointly estimate the equations of the different child activities. This approach is preferred to some alternative ones developed in the literature for two reasons. First, it takes into account the hypothesis that households' decisions on the different child activities are not independent. Second, it allows to also assume that the decision process between these activities is simultaneous (see Dar, Blunch, Kim and Sasaki (2002) for an exhaustive analysis of the scopes and drawbacks of most approaches used in the literature).

The rest of this paper is organized as follows. Section 2 discusses the estimation procedure. Section 3 describes the database used and presents some descriptive statistics. Section 4 presents the estimation results and section 5 concludes.

2. Model specification

The question that our model tries to answer can be expressed as follows: what factors affect the probability of a child being observed in one of the following activities: attend school, do housework, or work? We assume that children (or more realistically, their parents) choose the state that gives them the highest utility among the different choices. This assumption allows us to use the multinomial logit model introduced by McFadden (1973). The utility attached to each of the alternatives depends upon several exogenous characteristics such as age, household income, educational level of the household head, living arrangement, ethnicity, region, etc.

More precisely, we assume that individual i chooses alternative j if the associated utility, U_{ij}, is the highest of all J alternatives, that is $U_{ij} = \max\{U_{i1}, \ldots, U_{iJ}\}$. Obviously, these utility levels are not observed and we need to make several assumptions to make this set-up operational. Utility level is assumed to have two components: one non-stochastic function of observable, μ_{ij}, and an unobservable error term, ε_{ij}. From this, it follows that the probability for individual i to choose option j can be written as:

$$
\begin{aligned}
P_{ij} &= P\{U_{ij} = \max\{U_{i1}, \ldots, U_{iJ}\}\} \\
&= P\{\mu_{ij} + \varepsilon_{ij} > \underset{k=1,\ldots,J, k \neq j}{MAX} \{\mu_{ik} + \varepsilon_{ik}\}\}
\end{aligned}
\tag{1}
$$

The multinomial logit model assumes that all ε_{ij} are mutually independent with a log Weibull distribution (also known as a type I extreme value distribution). The distribution function of each ε_{ij} is given by:

$$
F(t) = \exp\{-e^{-t}\}
\tag{2}
$$

Under these assumptions, it can be shown that

$$
P_{ij} = \frac{\exp\{\mu_{ij}\}}{\exp\{\mu_{i1}\} + \exp\{\mu_{i2}\} + \ldots + \exp\{\mu_{iJ}\}}
\tag{3}
$$

With $P_{ij} \leq 1$ and $\sum_{j=1}^{J} P_{ij} = 1$.

The distribution of ε_{ij} sets the scaling of utility but not the location. To solve this, it is common to normalize one of the deterministic utility levels to zero, say $\mu_{i1} = 0$. For our model, we normalize the utility level of the alternative "attend school" to 0. We also assume that μ_{ij} is a linear function of observable variables that depend upon the individual. Thus, we can write $\mu_{ij} = X_i' \beta_j$. Then, we obtain:

$$
P_{ij} = \frac{1}{1 + \exp\{X_i'\beta_2\} + \ldots + \exp\{X_i'\beta_J\}} \quad , j = 1.
\tag{4}
$$

$$
P_{ij} = \frac{\exp\{X_i'\beta_j\}}{1 + \exp\{X_i'\beta_2\} + \ldots + \exp\{X_i'\beta_J\}} \quad , j = 2, \ldots, J.
\tag{5}
$$

This constitutes the multinomial logit model. The probability of an individual choosing alternative j is a simple expression of explanatory variables and coefficients β because of the convenient assumption made about the distribution of the unobserved errors.

This multinomial model is estimated by maximum likelihood, where the above probabilities enter the likelihood function. The log-likelihood for observation *i* is

$$
\log L_i = \sum_j y_{ij} \log P_{ij}
\tag{6}
$$

where $y_{ij} = 1$ if individual i chooses alternative j and 0 otherwise. The sample log-likelihood is then

$$
\log L = \sum_i \sum_{j_i} y_{ij} \log P_{ij}
\tag{7}
$$

The analysis conducted here is mainly descriptive and the results from the reduced-form model cannot be interpreted as structural. Some of our coefficients from the explanatory variables may suffer from endogeneity problems due to the selection process of unobserved background characteristics. Thus, our estimations may reflect both the impact of the variables themselves and the potential unobserved innate characteristics.

3. Description of child labor and school attendance in Senegal

The data used to analyze the characteristics and the determinants of child activities in Senegal are taken from the first "Enquête Sénégalaise Auprès des Ménages", ESAM-I (DPS, 1995). ESAM is an Incomes-Expenditures nation-wide survey conducted from March 1994 to April 1995 by the *Direction de la Prevision et de la Statistique* of the Senegalese Ministry of Finance. Data were collected on 3300 households from three strata: Dakar (the capital), other urban areas and rural areas. ESAM database contains rich information on individual

characteristics (age, education, gender, occupation and labor activity, marital status, etc), household characteristics (size, structure and composition, living conditions, access to water and living areas, etc), budget (consumption, incomes, etc), and wealth (housing, other assets and liabilities, etc). Such a database allows us to conduct an analysis on the determinants of children's time allocation in Senegal. The sample considered for this analysis consists of 4951 children aged between 10 and 15 years. Unfortunately, no information is available about the work patterns for younger children. This can represent a limitation for our study but 10 to 15 year-old children are those who are more likely to work and drop out of school relative to younger children. Another limitation of the survey is that it is impossible to determine whether children combine school and work. We only know whether the usual activity of the child is work, school or another activity. Moreover, we do not have the wage rate of working individuals.

In 1994-95, 22.1 % of 10 to 15 year-old children worked in Senegal, 51.1 % attended school and the rest did housework.[1] In urban areas, 10.7 % of children worked whereas 38.2 % did in rural areas. School attendance was higher in cities with 65.4 % compared to 30.9 % in rural areas. Table 1 presents the distribution of children at school and in the labor force in 1994 in Senegal. It shows an important gender differential in the different categories of child activities. This gender imbalance is particularly pronounced in the rural areas and it is in favour of girls only in the category "housework". Senegalese girls, whatever their age, are more involved in household chores than boys both in urban and rural areas. Such an imbalance in domestic tasks is typical of developing countries. It is also observed in Pakistan, Peru and Ghana by Maitra and Ray (2000) and in Ethiopia by Cockburn (2001). On the other hand, Senegalese boys, vis-à-vis girls, are more likely to attend school or to work. Notice that the distribution of children between schooling and working activities reverses with age. For older boys and girls, labor force participation increases while school attendance decreases. But school dropping-out is more pronounced for girls at age 15 in rural areas; their school attendance rate is only 8.8 %. This fact may be explained by the practice of early wedding in some rural zones in Senegal. Such a practice, widely spread in developing countries (Unicef, 2001; Ndiaye and Sarr, 1994; and Ceped, 1994), is pointed as one of the main causes of girls' school non-enrolment or dropping-out.

It is worth analyzing the different activities in which children are involved when they are at work. Table 2 presents the different occupations that children have in Senegal when they are defined as worker. We have classified the different activities in three main groups. The first one is 'family helper'; it consists of helping one member of the household in his job without receiving a wage in counterpart. The second type of work activity is 'apprentice': the child is presumed to be learning a vocational job but he can sometimes receive presents or pay from his trainer. The last category consists of pieceworkers, self-employed or wage earners; we call it 'Other'. Table 2 shows that these types of work differ between areas and sex. Most working boys are apprentices (70.4 %) in cities while the majority of them work as family helpers in rural regions (86.6 %). There are almost no apprentices in the rural sector. Family helper is the main type of job in the rural areas because most parents work in the agricultural sector. The majority of working girls in the urban areas are classified as 'other'.

Table 3 presents the summary statistics of individual and household characteristics according to children status (school, housework or work). We see important differences when we look at the education level of the household head. A relatively high share of children attending school live in a household where the head has a secondary or higher degree. Most working children have a household head that has not received any education. There is no difference between boys and girls regarding the education of the household head. As noted earlier, working children are the oldest on average.

We have also included four variables describing the living conditions of the household and the availability of basic services: direct access to water[2] in the household, the presence of an

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[1] Children who do not attend to school and do not work are assumed to do housework.

[2] Direct access to water is a dummy variable that is 1 if the main source of drinkable water is an inside tap or well, a water seller or a tank truck and zero otherwise.

electric or gas cooker, the presence of electric lighting and the average number of persons by room in the household. Most of these variables indicate that working (and houseworking) children are those who are in households with poor living conditions while those attending school have better living standards. Children doing housework are those who live in households where the average number of persons per room is the highest.

Direct access to water is an interesting variable in analyzing the determinants of children's time allocation in Senegal because it has a direct impact on the non-pecuniary cost of schooling for children and especially for girls. In traditional Senegalese household, the task to fetch the water is devoted to girls. As a result, we can expect that the direct water access increase the probability to attend school for children, and especially for girls. The same reasoning can apply for the presence of electric lighting or gas/electric cooker.

We also distinguish some difference according to the ethnic group of the household head: the Wolof/Lebu group is over-represented among working children while the Diola are over-represented among children attending school. As noted earlier, working children are concentrated in rural areas while the majority of children attending school live in cities. Household size is the largest for working boys and for girls attending school.

The number of workers aged 16 years or more is also included in the model in order to know whether adult and child labor are substitutes or complementary. Working children live in households where the number of adult workers is the highest on average.

Table 3 also presents total household income and total income minus children income. We see that children income only accounts for a very little part of total household income. The share of children income in total income is a bit larger for working children. Household income is the lowest for working children and the highest for those attending to school. Finally, Table 3 shows women's share of adult income. This turns out to be women's relative power within the household. We notice from this table that working boys and girls are likely to live in households with high women's bargaining power.

4. Estimation results

The multinomial logit model presented here describes how different household and individual characteristics influence the probability for a child being observed in one of the three following states: attend school, housework or work. The analysis is conducted separately for boys and girls as they (and of course their parents) can have different behaviors regarding their status.[3]

4.1 Coefficient estimates

Table 4 and 5 present the coefficient estimates from the multinomial logit model for boys and girls, respectively.[4] School attendance is the reference category.

The educational level of the household head is presumed to have important effects on children's time allocation. In fact, highly educated parents are more likely to have more information about the return from schooling. Moreover, they can help their children more efficiently in their learning process and lower their dropout rate. Results show that the probability to do housework or to work decreases significantly when the educational level of the household head is high. As predicted, there is a positive relationship between the education of the household head and their children. Boys and girls are likely to be less involved in a working activity or home tasks as the head of the household is more educated. There are noticeable gender differences between the estimates of this effect.

Age is expected to have a positive impact on the probability to work since older children are more likely to help their family in work or to drop out of school following a failure.

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[3] We performed the Hausman test for the assumption of independence of irrelevant alternative for boys and girls and find that this assumption is not rejected for boys whatever the omitted category while the assumption is rejected for girls, but only when the "housework" category is omitted.

[4] The model also includes 9 regional dummies. Coefficient estimates of these variables are presented in the annex.

Results confirm this hypothesis. The probability to work or to do housework significantly increases as boys or girls get older. Also, children living in rural areas are more likely to work and do housework. They have also a lower probability to attend school.

We have included several variables reflecting the poverty status of the children's household. One is the logarithm of the total household income minus children income. This variable (as postulated by the *Basu-Van Luxury Axiom*) is predicted to have a positive impact on schooling since, in the presence of credit constraints, poorer households may lack access to credit market in order to support both direct and opportunity costs of education. Moreover, low-income households may have to send their children to work to be able to make ends meet. Results confirm such a prediction. Estimates show that, for boys and girls, the probability to work decreases significantly as household income increases. However, its impact on the probability for children to do housework is not significant for boys. An other variable highlighting the impact of living standards on child status is the average number of persons per room. We find that the higher number of persons by room, the higher is the probability for boys to do housework and to work. In contrast, this has no significant impact on the probability for girls to work.

Our investigations also focus on the impact of having basic services and facilities like electric/gas cooker, electric lighting and direct access to water within the household. It turns out that these variables have significant impacts on child status (see tables 4 and 5). Having an electric/gas cooker significantly decreases the probability to do housework for boys and girls. This is understandable given that in households without an electric or gas cooker, meals are prepared basically with woods or charcoal. In these households, fetching woods or charcoal are presumably among children domestic tasks. The presence electric lighting has also a negative impact on the probability to work or to do housework for boys and girls; but the impact is not significant. Results also indicate that having direct access to a source of water significantly decreases the probability to work and to do housework for both boys and girls. Such an effect is not surprising for girls owing to the fact that fetching water to a source outside the household is a task usually devoted to girls in Senegalese society.

However, one caveat is worth highlighting in the interpretation of the impact of these basic services. Our results could be biased due to some endogeneity. For example, the probability of having direct access to water or electricity is likely to be correlated with the development of the infrastructures (in particular with education facilities) in the areas where household live. In other words, households having direct access to water are likely to live in an area where the supply of education is higher. If this is true, the estimated coefficients of the impact of direct access to water or electricity on the probability to attend to school are upward biased. We should then take into account for this omitted variable bias. One way of correcting for that is to include a variable reflecting the development of the infrastructures in the area of the household. ESAM does not contain this kind of information directly but it is possible to construct a proxy variable that reflects the degree of development of the infrastructure in the neighborhood of the household. To do so, we construct a variable indicating the proportion of households having a tap by district of census[5]. This infrastructure proxy decreases housework for girls and work for boys (See Table 6 and 7). Regarding the impact of the presence of basic services in the household, having a direct access to water still significantly increases school attendance for boys and girls but the magnitude of this impact is now lower than in the previous specification. In contrast, the impacts of having an electric or gas cooker and access to electric lighting do not differ once we include the infrastructure proxy.

Our results also indicate that ethnic membership is determinant on child status. Children who are Wolof or Lebu have a higher probability to work than those belonging to another ethnic group. In contrast, children from Diola ethnic group have a higher probability to attend school. We investigated whether these ethnic differences are related to differences in the access to the

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[5] The district of census contains between 14 and 24 surveyed households in ESAM.

resources (luxury axiom effect) or to the educational facilities (accessibility effect). But there is no evidence, which indicates that. In fact, this result reflects cultural differences in attitudes vis-à-vis child activities in Senegalese society. It is worth stressing that cultural norms and social perception about the value of schooling are prominent determinants of children outcomes (Bachmann, 2000).

In our estimations, we also look at the impact of living arrangements of Senegalese households on children's status. Our expectations were that the presence of very young children in the household might reduce school attendance and work among older children in order to take care of them. However, estimated results show that this is not strongly verified. The presence of young children (0 to 5 year-old) in the household has almost no impact on child status. Apparently, older children do not have a role of child minders. Furthermore, we look at what is the impact of the number of adults in the household on children outcomes. A naive prediction would certainly consider that this would have a positive impact on the probability for children to attend school. The intuition is grounded on the idea that more adults are present to take care of young children and to provide sufficient resources to the household. However, our results are not conclusive. On one part, estimates indicate that the number of adults and elderly significantly decreases the probability for boys and girls to work. Does this implicate that there is labor substitution between adults and children? Presumably not. Estimates, on the other part, show that children have a higher probability to work than to attend school when the number of adult workers in the household increases. Moreover, the number of adult workers decreases the probability for boys to do housework. Results suggest thus labor complementarities between adults and children (descriptive statistics indicate that most working children are family helpers). This must be explained by the fact that most adult workers evolve in the rural or informal sectors where child labor is very involving.

In our estimations, we also investigate of women's relative power on children activities. The descriptive statistics in Table 2 suggest that working children live in household with a higher women's bargaining power. However, once we control for household characteristics in our model, we find that coefficients related to women's relative power for housework and work are negative and significant for both boys and girls. This means that, ceteris paribus, the probability for boys and girls to go to school increases with women's power. Such a result is partly conform to the findings of Basu (2001) and Basu and Ray (2001). It has also an important policy implication. It suggests that to curb child labor and increases child schooling, policy action should favor women empowerment.

4.2 Marginal effects

The results presented above show the direction of the impact of the explanatory variables on the different outcomes but not their magnitudes. Without this information, it is difficult to fully appreciate the different determinants of child activities in Senegal. Marginal effects can help evaluating these magnitudes and show the impact of a marginal change in the explanatory variable on the different estimated probabilities associated to child time use. Table 8 and 9 present the marginal effects of the multinomial logit model used in this analysis. They are calculated at the sample means of the explanatory variables.

For boys, the probability to attend school, to do housework or to work is 66.2%, 14.9% and 18.9%, respectively. For girls, these probabilities are 45.7%, 46.6% and 7.7%, respectively. If the household head has a secondary or higher education level, the probability to attend school increases by 25.1 percentage points while the probability to work decreases by 17.0 for boys. The impact of education of household head on school attendance is even stronger for girls with a 36.4% increase of probability at the expense of housework when household head has a secondary or higher degree. These results highlight the importance of the education of the parents on child status.

We noticed earlier that the distribution of children between schooling and working activities reverses, as they grow older. Marginal effects confirm the negative impact of age on school attendance. However the magnitude of such an impact differs between girls and boys (9.1 versus 6.4%). It is also worth noting a gender difference in post-school activities. Almost

all the boys who drop out from school go to the labor market while two-third of girls do housework.

Let us now consider the marginal effects of household poverty status. We already saw that for boys and girls, higher household income is associated with a lower probability to work and a higher probability to attend school. The marginal effects confirm such income impacts. However, they tend to be moderate as household adult income increases (see Figure 1). This can be explained by the following reasons: First, we have included in our model several variables reflecting the quality of the living conditions of the household, which are positively correlated to household income. This automatically attenuates the household income impact on child status compared to other findings that do not include such variables. Second, a large part of working children live in an agricultural family in which it is difficult to evaluate the contribution of each individual to household income and particularly for the children who help their parents. As a consequence, this endogeneity issue can downward bias the impact of household income on the probability to work for children. Compared to deprivation indicators, household income has a relatively small impact on children time. For instance, having a direct access to water, hugely and significantly, increases boys and girls school enrolment by 12.6 and 15.8 %, respectively, at the expense of working or doing housework.

Tables 10 and 11 presents the marginal effects of the presence of basic services in the household once we include the infrastructure proxy. Two points are worth emphasizing. The first is that the level of development of the infrastructure has significant positive effects on the probability to attend to school: a 10-points of percentage increase in the proportion of household having a tap in the district of census increases school attendance by 1% for boys and 2.6% for girls. This highlights the importance of the infrastructures in school enrolment in Senegal. The second point is related to the impact of a direct access to a current source of water. This affects positively and significantly the probability for boys and girls to attend school (by 10%), but the size of that impact is lower when we control for the development of the infrastructures than when we do not.

Marginal effects indicate also that the presence of children below 9 years old within the household has almost no significant impact on children activities. This allows us to confirm our finding that older children do not have a role of child minders. In contrast, the presence of adult workers affects significantly children's time use. An additional working adult increases the probability to work by 6.4 percentage points for boys and 4.5 points for girls. Marginal effects clearly suggest that child and adult labor are complementary.

We also notice that being Diola increases the probability to attend school by 18.5 percentage points at the expense of the probability to work and to do housework for boys. For girls, the impact is an increasing probability to attend school (by 15.6 percentage points) at the expense of doing housework.

Regarding the living areas, the probability to attend school is the lowest for boys and girls living in rural area. Compared to the urban area, the probability to attend school decreases by 13.3 percentage points in rural area for boys and 19.3 for girls.

Marginal effects of women's bargaining power regarding child activities are quite important (see Figure 2). For boys, a 10% increase in women's bargaining power is associated to 1.5% increase in the probability to attend school at the expense of work (-1%) and housework (-0.5%). For girls, a similar increase raises the probability to attend school by 0.8% at the expense of work (-0.3%) and housework (-0.5%) but these marginal effects are not significant.

5. Conclusion

Understanding why a Senegalese child is doing one activity and not another one has been the principal motivation of this paper. Using data from the most reliable Senegalese household survey (Esam-I), we test the impact of household living standard and living arrangements, parental background, the presence of basic services, adult activities, gender balance of power and ethnic differences on children outcomes. Among some of the main interesting results is that household living standard significantly affects children involvement in the different types of activities. When household adult income increases, the probability for boys and girls to work decreases significantly while their enrolment in school increases, as

predicted by the luxury axiom. However, this impact tends to be modest. In contrast, household's adult income does not have significant impact on the probability for children to do housework. We observe that the probability of doing housework changes with the presence or not of basic services, especially for girls: children living in households having direct access to water, electric/gas cooker are less likely to devote most of their time to housework even if we control for the development of infrastructure in the area where the household lives. This highlights the importance of opportunity costs of schooling in non-pecuniary form especially for girls. Direct access to water also increases school attendance at the expense of work for boys.

A result of this paper that is worth being emphasized is that women's power affects significantly children activities. We find that as women's power increases, Senegalese children are less likely to do housework or to work while their probability to attend school increase.

We also observe that adult background has a significant impact on children activities. Children in a household where the head has a relatively high level of education are less likely to participate in the labor market or to do housework and more likely to attend school. This impact likely points to the importance of adult education on children outcomes. Our results indicate that cultural and social norms matter a lot in household decisions to send children to school or to work. Therefore, educating the adults could be useful in improving children outcomes.

To recap, evidence from this paper indicates that building new school, improving school quality, subsidizing school, banning child labor or making compulsory school attendance are not sufficient to improve schooling and curb child labor in Senegal. Greater emphasis should also be put on access to basic services and facilities like current water (to decrease the opportunity cost of schooling), on women empowerment in terms of access to resources, households living conditions, and on the cultural perception of the role of education.

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Table 1: Activity distribution, by region, sex and age (1994-95)

Age	Boys				Girls		
		Urban					
	School	Housework	Work		School	Housework	Work
10	87.2%	10.0%	2.8%		76.7%	21.7%	1.6%
11	81.1%	14.6%	4.3%		73.3%	23.8%	2.9%
12	76.6%	12.7%	10.7%		63.5%	32.0%	4.6%
13	74.2%	13.5%	12.3%		56.3%	36.9%	6.7%
14	61.6%	13.4%	25.0%		47.8%	44.7%	7.5%
15	52.9%	14.7%	32.4%		35.4%	45.0%	19.6%
All ages	72.8%	13.1%	14.1%		58.2%	34.4%	7.4%
		Rural					
	School	Housework	Work		School	Housework	Work
10	46.0%	19.6%	34.5%		30.7%	48.0%	21.2%
11	33.5%	20.6%	45.8%		24.3%	53.4%	22.3%
12	45.6%	11.8%	42.6%		25.4%	46.7%	27.8%
13	37.4%	19.5%	43.2%		22.7%	40.2%	37.1%
14	36.0%	9.9%	54.0%		22.2%	44.9%	32.9%
15	25.4%	13.9%	60.7%		8.8%	55.3%	35.8%
All ages	38.1%	16.1%	45.9%		22.5%	48.3%	29.2%

Table 2: Distribution of occupation among working children, by region and sex (1994-95)

	Urban		Rural	
	Boys	Girls	Boys	Girls
Family helper	24.6%	19.4%	86.6%	82.2%
Apprentice	70.4%	13.9%	2.0%	0.0%
Other	4.9%	66.7%	11.4%	17.8%
	100%	100%	100%	100%

Table 3: Descriptive statistics for 10 to 15 year-old children in Senegal (1994-95)

| | Boys | | | | Girls | | | |
	Total	School	Housewor k	Work	Total	School	Housewor k	Work
Number of observations	2543	1466	366	711	2408	1066	959	383
Education of household head:								
None	72%	60%	86%	91%	72%	53%	85%	90%
Primary	14%	18%	8%	7%	14%	21%	10%	8%
Secondary	14%	22%	6%	2%	14%	26%	5%	2%
	100%	100%	100%	100%	100%	100%	100%	100%
Age of children	12.41	12.17	12.34	12.94	12.52	12.11	12.75	13.07
Living conditions:								
Gas/electric cooker	22%	31%	12%	10%	25%	37%	18%	7%
Electric lighting	40%	55%	30%	15%	41%	61%	30%	13%
Direct access to water	44%	58%	32%	19%	46%	67%	33%	21%
Number of persons per room	2.77	2.71	3.01	2.77	2.82	2.73	3.00	2.63
Ethnic group:								
Wolof/Lebu	44%	42%	38%	50%	45%	44%	44%	49%
Pular	21%	17%	33%	23%	24%	19%	32%	16%
Sereer	14%	14%	16%	13%	13%	13%	11%	16%
Diola	6%	8%	1%	2%	5%	8%	2%	3%
Other/n.a.	16%	18%	12%	13%	14%	16%	11%	16%
	100%	100%	100%	100%	100%	100%	100%	100%
Rural area	44%	29%	49%	71%	39%	20%	47%	72%
Living arrangement :								
Children 0_5	2.58	2.48	2.63	2.74	2.48	2.38	2.49	2.72
Children 6_9	1.90	1.84	1.82	2.06	1.76	1.78	1.71	1.79
Children10_15	3.31	3.31	3.28	3.31	2.97	3.19	2.80	2.79
Men 16_54	2.51	2.58	2.36	2.44	2.43	2.65	2.25	2.26
Women 16_54	3.19	3.22	3.11	3.17	3.06	3.23	2.90	2.99
Men 55+	0.45	0.41	0.53	0.48	0.43	0.41	0.44	0.45
Women 55+	0.48	0.48	0.49	0.49	0.46	0.45	0.44	0.52

Household size	14.42	14.32	14.22	14.69	13.59	14.09	13.03	13.52
Number of workers (16+)	3.56	3.14	2.87	4.78	3.51	3.20	3.26	5.02
Household income/10000 (CFA)	339.1	408.4	354.7	188.2	309.3	422.6	240.1	167.3
(Household income-children income)/10000 (CFA)	338.2	407.9	354.2	186.3	308.1	421.7	239.4	164.1
Women's bargaining power	0.39	0.39	0.37	0.40	0.40	0.38	0.42	0.44

Table 4. Multinomial logit estimates for 10 to 15 year-old boys in Senegal (1994-95)

	School	Housework		Work	
	Reference	Coefficient	Std error	Coefficient	Std error
Intercept	-	-1,813	1,022*	-2,425	0,966**
Education of household head:					
None	-	-		-	
Primary	-	-0,678	0,224***	-0,557	0,201***
Secondary	-	-1,049	0,260***	-1,757	0,321***
Age of children	-	0,120	0,038***	0,415	0,036***
Log(hh income-child income)	-	-0,031	0,064	-0,254	0,060***
Gas/electric cooker	-	-0,717	0,219***	0,160	0,211
Electric lighting	-	-0,308	0,195	-0,324	0,203
Direct access to water	-	-0,473	0,170***	-0,652	0,161***
Number of persons by room	-	0,147	0,045***	0,148	0,046***
Ethnic group:					
Wolof/Lebu	-	-		-	
Pular	-	0,471	0,176***	0,209	0,174
Sereer	-	-0,115	0,204	-0,996	0,195***
Diola	-	-0,979	0,536*	-1,023	0,401**
Other/n.a.	-	-0,198	0,216	-0,880	0,209***
Rural area	-	0,220	0,199	0,866	0,194***
Living arrangement :					
Children 0_5	-	-0,033	0,041	-0,075	0,037**
Children 6_9	-	-0,068	0,051	-0,058	0,047
Children10_15	-	-0,028	0,037	-0,055	0,036
Men 16_54	-	0,076	0,043*	-0,150	0,046***
Women 16_54	-	0,035	0,044	-0,109	0,044**
Men 55+	-	0,197	0,113*	-0,121	0,113
Women 55+	-	-0,029	0,101	-0,253	0,095***

Number of workers (16+)	-	-0,076	0,036**	0,405	0,038***
Women's bargaining power	-	-0,591	0,184***	-0,752	0,169***
Number of observations	1466	366		711	

Note : The sign « - » means that the variable refers to the intercept.
*   means that the estimate is significant at 10% level.
**   means that the estimate is significant at 5% level.
***   means that the estimate is significant at 1% level.
        Regional dummies are also included in the model

Table 5: Multinomial logit estimates for 10 to 15 year-old girls in Senegal (1994-95)

	School	Housework		Work	
	Reference	Coefficient	Std error	Coefficient	Std error
Intercept	-	-1,444	0,909	-2,330	1,314*
Education of household head:					
None	-	-		-	
Primary	-	-0,730	0,157***	-0,587	0,259**
Secondary	-	-1,536	0,191***	-1,913	0,438***
Age of children	-	0,331	0,032***	0,569	0,048***
Log(hh income-child income)	-	-0,127	0,059**	-0,353	0,083***
Gas/electric cooker	-	-0,387	0,154**	-0,673	0,303**
Electric lighting	-	-0,187	0,156	-0,185	0,268
Direct access to water	-	-0,643	0,131***	-0,615	0,204***
Number of persons by room	-	0,155	0,035***	0,050	0,061
Ethnic group:					
Wolof/Lebu	-	-		-	
Pular	-	-0,108	0,147	-0,588	0,254**
Sereer	-	-0,988	0,186***	-0,449	0,245*
Diola	-	-0,867	0,327***	0,218	0,485
Other/n.a.	-	-0,522	0,178***	-0,309	0,273
Rural area	-	0,781	0,170***	0,883	0,256***
Living arrangement :					
Children 0_5	-	0,035	0,034	0,011	0,050
Children 6_9	-	-0,040	0,047	-0,129	0,067*
Children10_15	-	-0,122	0,036***	-0,103	0,055*
Men 16_54	-	0,035	0,038	-0,414	0,069***
Women 16_54	-	-0,044	0,039	-0,337	0,068***
Men 55+	-	-0,046	0,099	-0,529	0,151***
Women 55+	-	-0,115	0,093	-0,276	0,130**

Number of workers (16+)	-	0,054	0,034	0,659	0,059***
Women's bargaining power	-	-0,296	0,153*	-0,528	0,219**
Number of observations :	1066	959		383	

Note : The sign « - » means that the variable refers to the intercept.

    *   means that the estimate is significant at 10% level.

   **   means that the estimate is significant at 5% level.

  *** means that the estimate is significant at 1% level.

   Regional dummies are also included in the model

Table 6: Multinomial logit estimates for 10 to 15 year-old boys in Senegal (1994-95)

	School	Housework		Work	
	Reference	dy/dx	Std error	dy/dx	Std error
Gas/electric cooker	-	-0,721	0,219***	0,127	0,212
Electric lighting	-	-0,290	0,199	-0,242	0,206
Direct access to water	-	-0,445	0,183**	-0,488	0,176***
Proportion of household having a tap in the district of census	-	-0,131	0,329	-0,739	0,324**
Rural	-	0,188	0,217	0,689	0,208***

Table 7: Multinomial logit estimates for 10 to 15 year-old girls in Senegal (1994-95)

	School	Housework		Work	
	Reference	dy/dx	Std error	dy/dx	Std error
Gas/electric cooker	-	-0,386	0,155**	-0,670	0,304**
Electric lighting	-	-0,054	0,159	-0,098	0,274
Direct access to water	-	-0,389	0,144***	-0,463	0,219**
Proportion of household having a tap in the district of census	-	-1,121	0,263***	-0,686	0,448
Rural	-	0,556	0,178***	0,746	0,278***

Table 8: Marginal effects on the probability to attend school, do housework or work for boys

	School 0.662		Housework 0.149		Work 0.189	
	dy/dx	Std error	dy/dx	Std error	dy/dx	Std error
Education of household head:						
None	-		-		-	
Primary[1]	0,125	0,030***	-0,063	0,021***	-0,063	0,024***
Secondary[1]	0,251	0,027***	-0,081	0,021***	-0,170	0,020***
Age of children	-0,064	0,007***	0,003	0,005	0,060	0,005***
Log(hh income-child income)	0,035	0,011***	0,003	0,008	-0,038	0,009***
Gas/electric cooker[1]	0,039	0,037	-0,083	0,020***	0,044	0,035
Electric lighting[1]	0,070	0,034**	-0,030	0,023	-0,040	0,029
Direct access to water[1]	0,126	0,028***	-0,041	0,020**	-0,085	0,023***
Number of persons by room	-0,033	0,008***	0,014	0,005***	0,019	0,007***
Ethnic group:						
Wolof/Lebu	-		-		-	
Pular[1]	-0,076	0,034**	0,058	0,025**	0,017	0,026
Sereer[1]	0,112	0,031***	0,007	0,026	-0,119	0,018***
Diola[1]	0,185	0,049***	-0,080	0,038**	-0,105	0,035***
Other/n.a. [1]	0,113	0,033***	-0,005	0,026	-0,108	0,021***
Rural area[1]	-0,133	0,036***	0,002	0,024	0,131	0,031***
Living arrangement :						
Children 0_5	0,013	0,007*	-0,002	0,005	-0,011	0,005*
Children 6_9	0,014	0,009	-0,007	0,006	-0,007	0,007
Children10_15	0,010	0,007	-0,002	0,005	-0,008	0,005
Men 16_54	0,011	0,008	0,014	0,005***	-0,025	0,007***
Women 16_54	0,010	0,008	0,007	0,005	-0,018	0,007***
Men 55+	-0,004	0,020	0,028	0,014**	-0,024	0,017
Women 55+	0,034	0,018**	0,003	0,012	-0,038	0,014***
Number of workers (16+)	-0,043	0,007***	-0,021	0,004***	0,064	0,006***

	School 0,457		Housework 0,466		Work 0,077	
	dy/dx	Std error	dy/dx	Std error	dy/dx	Std error

	dy/dx	Std error	dy/dx	Std error	dy/dx	Std error
Women's bargaining power	0,152	0,032***	-0,054	0,022**	-0,099	0,025***

Note : The sign « - » means that the variable refers to the intercept.

    *   means that the estimate is significant at 10% level.

    **   means that the estimate is significant at 5% level.

    *** means that the estimate is significant at 1% level.

[1] dy/dx is for discrete change of dummy variable from 0 to 1

Table 9: Marginal effects on the probability to attend school, do housework or work for girls

	School 0,457		Housework 0,466		Work 0,077	
	dy/dx	Std error	dy/dx	Std error	dy/dx	Std error
Education of household head: None						
Primary[1]	0,175	0,036***	-0,158	0,034***	-0,017	0,015
Secondary[1]	0,364	0,034***	-0,300	0,033***	-0,064	0,013***
Age of children	-0,091	0,008***	0,062	0,007***	0,029	0,003***
Log(hh income-child income)	0,040	0,014***	-0,019	0,013	-0,021	0,006***
Gas/electric cooker[1]	0,106	0,037***	-0,074	0,036**	-0,031	0,017*
Electric lighting[1]	0,046	0,037	-0,040	0,037	-0,006	0,018
Direct access to water[1]	0,158	0,031***	-0,137	0,030***	-0,021	0,013
Number of persons by room	-0,035	0,008***	0,037	0,008***	-0,002	0,004
Ethnic group: Wolof/Lebu						
Pular[1]	0,042	0,036	-0,008	0,034	-0,034	0,013**
Sereer[1]	0,219	0,041***	-0,216	0,036***	-0,003	0,015
Diola[1]	0,156	0,073**	-0,207	0,062***	0,051	0,050
Other/n.a. [1]	0,122	0,042***	-0,117	0,039***	-0,005	0,017
Rural area[1]	-0,193	0,038***	0,158	0,038***	0,035	0,018*
Living arrangement :						
Children 0_5	-0,008	0,008	0,008	0,008	0,000	0,003
Children 6_9	0,013	0,011	-0,005	0,011	-0,008	0,004*
Children10_15	0,030	0,009***	-0,027	0,008***	-0,003	0,004
Men 16_54	0,007	0,009	0,024	0,009***	-0,031	0,005***
Women 16_54	0,021	0,009**	0,001	0,009	-0,022	0,004***
Men 55+	0,028	0,024	0,008	0,023	-0,036	0,010***
Women 55+	0,034	0,022	-0,019	0,021	-0,016	0,008*

Number of workers (16+)	-0,035	0,008***	-0,010	0,008	0,045	0,004***
Women's bargaining power	0,082	0,037**	-0,055	0,035	-0,027	0,014*

Note : The sign « - » means that the variable refers to the intercept.
*   means that the estimate is significant at 10% level.
**   means that the estimate is significant at 5% level.
***   means that the estimate is significant at 1% level.
[1] dy/dx is for discrete change of dummy variable from 0 to 1

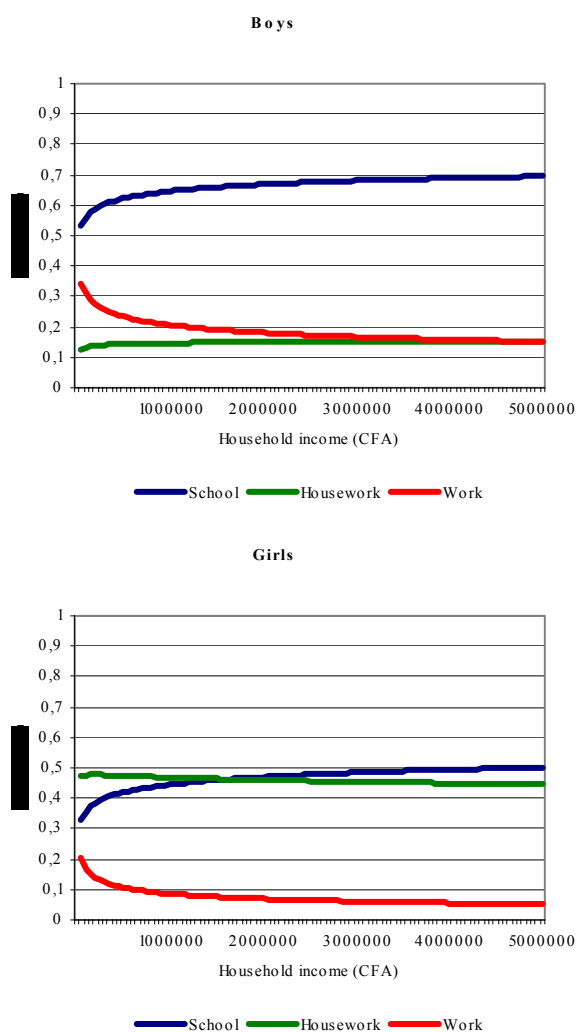**Figure 1: Estimated probability of the different outcomes according to household income**

Boys

Girls

Figure 2: Estimated probability of the different outcomes according to women's bargaining power

Boys

Girls
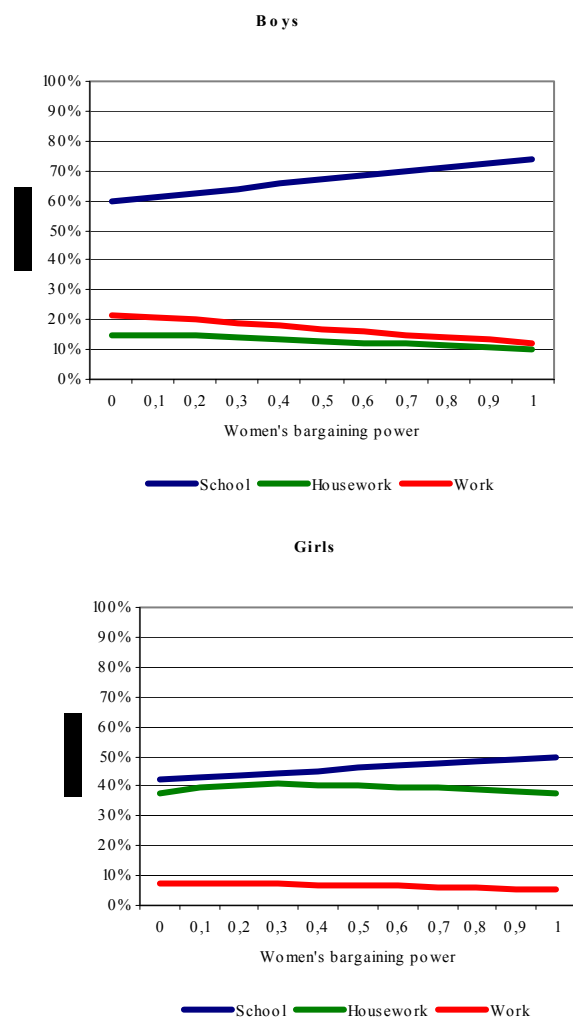
Table 10: Marginal effects on the probability to attend school, do housework or work for boys

	School		Housework		Work	
	dy/dx	Std error	dy/dx	Std error	dy/dx	Std error
Gas/electric cooker[1]	0,044	0,037	-0,082	0,020***	0,038	0,034
Electric lighting[1]	0,058	0,035*	-0,030	0,024	-0,029	0,030
Direct access to water[1]	0,103	0,031***	-0,042	0,022*	-0,061	0,025**
Proportion of household having a tap in the district of census	0,105	0,058*	0,004	0,041	-0,109	0,048**
Rural[1]	-0,106	0,039***	0,004	0,026	0,102	0,032***

Note : The sign « - » means that the variable refers to the intercept.
    * means that the estimate is significant at 10% level.
    ** means that the estimate is significant at 5% level.
    *** means that the estimate is significant at 1% level.
[1] dy/dx is for discrete change of dummy variable from 0 to 1

Table 11: Marginal effects on the probability to attend school, do housework or work for girls

	School		Housework		Work	
	dy/dx	Std error	dy/dx	Std error	dy/dx	Std error
Gas/electric cooker[1]	0,106	0,037***	-0,074	0,036**	-0,031	0,017*
Electric lighting[1]	0,015	0,038	-0,010	0,037	-0,005	0,018
Direct access to water[1]	0,099	0,034***	-0,080	0,033**	-0,019	0,014
Proportion of household having a tap in the district of census	0,263	0,063***	-0,254	0,062***	-0,009	0,030
Rural[1]	-0,143	0,041***	0,109	0,041***	0,034	0,020*

Note : The sign « - » means that the variable refers to the intercept.
    * means that the estimate is significant at 10% level.
    ** means that the estimate is significant at 5% level.
    *** means that the estimate is significant at 1% level.
[1] dy/dx is for discrete change of dummy variable from 0 to 1

Table 4(continued): Multinomial logit results for boys (regional dummies)

	School	Housework		Work	
	Reference	Coefficient	Std error	Coefficient	Std error
Kolda	-	-0,300	0,349	-0,234	0,324
Dakar	-	-		-	
Ziguinchor	-	-1,066	0,424**	-1,154	0,407***
Diourbel	-	-0,200	0,329	0,294	0,279
Saint-Louis	-	-0,010	0,240	-0,576	0,266**
Tambacounda	-	-0,027	0,445	1,043	0,367***
Kaolack	-	-0,009	0,263	0,262	0,257
Thies	-	0,259	0,231	0,397	0,226*
Louga	-	0,236	0,318	0,466	0,295
Fatick	-	0,074	0,311	0,324	0,306

Table 5(continued): Multinomial logit results for girls (regional dummies)

	School	Housework		Work	
	Reference	Coefficient	Std error	Coefficient	Std error
Kolda	-	0,217	0,348	0,916	0,459**
Dakar	-	-		-	
Ziguinchor	-	-0,980	0,298***	-1,734	0,520***
Diourbel	-	0,441	0,267*	-0,169	0,415
Saint-Louis	-	-0,037	0,209	-0,757	0,401
Tambacounda	-	-0,146	0,333	0,469	0,451
Kaolack	-	-0,776	0,231***	0,282	0,331
Thies	-	-0,027	0,191	-0,362	0,338
Louga	-	-0,133	0,278	-0,063	0,400
Fatick	-	-0,842	0,279***	-0,560	0,405