QUADERNI DEL DIPARTIMENTO DI SCIENZE ECONOMICHE E SOCIALI

SCHOOL ATTENDANCE, CHILD LABOUR AND GENDER BIAS IN MOROCCO

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Serie Rossa: Economia – Quaderno N. 54 dicembre 2008

UNIVERSITÀ CATTOLICA DEL SACRO CUORE

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"ESEMPLARE FUORI COMMERCIO PER IL DEPOSITO LEGALE AGLI EFFETTI DELLA LEGGE 15 APRILE 2004, N. 106"

SCHOOL ATTENDANCE, CHILD LABOUR AND GENDER BIAS IN MOROCCO

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Keywords: child labour, school attendance, gender bias, Morocco, probit models.

JEL Classification: C35, I21, J16, J24.

Abstract. Using cross-sectional data and employing probit models, the paper investigates child school attendance and labour in Morocco. Results indicate that education is a luxury good which can be purchased more easily by the non-poor. Moreover, a child is more likely to be in school if he/she is residing in an urban area and is the son/daughter of the head of the household. However, the Body Mass Index *(BMI)* - used to account for the impact of proper nutrition status on attendance probability - deters school attendance. More detailed empirical evidence is obtained by estimating the same type of models on gender based subsamples. Poverty status, household size and the provincial average of time taken to travel to school in minutes lessen the probability of female school attendance. If a female child lives in a household headed by a female, the pupil should have higher likelihood of school attendance. Besides being a quite common result, this occurrence can be employed to devise a policy initiative of disbursing to the female head a monetary or in-kind transfer devoted to pupils' education which can be most cost-effective in closing the gender gap as required by the second Millennium Development Goal *(MDG)*. The probability of a male going to school is limited by the significant role of some regional location dummies and living with an aged household head. The variables which are significant in both single-genders models generate higher probabilistic effects for females compared to males.
As expected, the child labour models estimate coefficients which are most of the time opposite in sign to the ones in the educational. The variable which is consistently associated with a negative influence on the dependent variable is the age of the household head. The significance of the yearly per capita expenditure in the child labour investigations might be driven by some endogeneity or the inclusion of asset variables. Besides the econometric problem, it undermines the confidence attached to the implementation of a cash/in-kind transfers devoted to curb child labour and promote school attendance. Industry localization effects and complementarity in within-household labour choices are present. The investigation carried out on gender-specific samples finds a inverted U shaped female trajectory in age probably due to early pregnancy. Moreover, poverty condition improves males probability of working while it diminishes female's school participation.

Acknowledgements. This paper is the development of my master thesis at the University of Sussex. I thank Dr. Michael Gasiorek for providing the data, Dr. Barry Reilly for guidance on the econometrics, Mohamed Doudich for providing additional documentation related to the data. External help has come from Michael Grimm, Giovanni Vecchi, William Greene, Sonia Bhalotra and Anu Rammohan. I acknowledge the advisory role of the participants to the MA in Development Economics 2006-07 at Sussex University (UK). A special recognition goes to Dr. Jeffery Round for invaluable improving comments, Francis Wasswa, Nigussie Tefera and Silvia Platoni for carefully reading several preliminary versions, Anna Agliari for theoretical discussions, Enrico Fabrizi for useful insights on the methodological part, Riccardo Grazioli for editorial solutions and Gerald and Hilary Isaacs for proofreading it. The financial and logistic support of the Università Cattolica del Sacro Cuore is gratefully acknowledged. All the remaining errors and omissions are mine.

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Introduction

Child labour and pupils' school attendance are crucial policy issues particularly in developing countries. According to ILO (2006), in 2004 166 million children aged 5-14 years were labourers while 74 million were involved in hazardous work. Despite the "large numbers" the two stocks have fallen in size by 11 and 33 percent respectively since the last global survey in 2000 (ILO, 2006:6-7). In 2001/02 115 million children, in primary age, were out of school (UIS, 2005) while UNICEF (2004) reports that 121 million children[1] were denied the right to universal education.

It could be argued that at any point in time the stock of child labourers and out of school pupils is determined by the dynamics of the factors which can increase or reduce the likelihood child labour. These incentives and mitigating forces occur at the international or national and household or family level[2].

At the "macro" level, a higher incidence of child labour can be due to perverse incentives arising from economic policies centred on national growth. The attraction of foreign direct investments or multinational corporations in developing countries might lead to subsidiary branches employing locally sourced child labour. Hence, greater global integration may have mixed effects, at least on the poor through the rise in national production and labour demand (Ravallion and Wodon, 2000). Nonetheless, Cigno *et al.* (2002) in a cross section study do not find any support for increased trade between countries raising, *per se*, the incidence of child labour. The norms which are likely to deter child labour at the "macro" level are the 1990 Convention on the Rights of the Child, international trade sanctions toward countries where child labour is a relevant phenomenon, a ban on child labour and a minimum wage policy.

[1] Despite the absence of a clear indication of the geographic reference for this figure (i.e. worldwide, in Africa or in Sub-Saharan Africa), it is believed that this count corresponds to a worldwide scale. The quoted figures are likely to underestimate the true extent of the child labour phenomenon heavily. Admassie (2003) attributes the measurement error to official surveys being unable to record those pupils who work at home, in subsistence agriculture and attend unpaid jobs in the informal sector. Additional distortion arises from child labour being illegal in several countries suich that parents underreport on their children's work.

[2] For expositional purposes the former two aggregation levels will be considered as the "macro" level of the problem while the latter two the "micro" level.

The Convention on the Rights of the Child is probably the most authoritative piece of international jurisprudence which protects the children's human rights to spend their youth playing and socializing[3], avoiding dangerous work practices[4] (Admassie, 2003). International trade sanctions might be ineffective or even counterproductive. Bhalotra (2003) and Admassie (2003) suggest that "the proportion of output [from child labour] exported is rather minimal" (Admassie, 2003:169) in several subsistence economies of the African continent to make any significant difference. Jafarey and Lahiri (2002) identify a set of conditions, which might be common to several countries, that could lead to a rise in the amount of time spent working at the expense of schooling time. On the other hand, Jafarey and Lahiri (2002) demonstrate that the existence of a national credit market can mitigate the extent of child labour increasing schooling attendance.

A national ban on child labour is likely to hurt those household which are extremely poor or use child labour as an essential coping strategy in presence of market failures (Beegle *et al.*, 2006). In these conditions, a timely government transfer compensating for forgone income could preserve household consumption levels while inducing higher child schooling attendance (Ravallion and Wodon, 2000). Grimm (2005) suggests that proactive education policies may be a substitute for monetary transfers in that making the knowledge distribution more even could diminish the country's poverty and inequality incidence.

Finally, a minimum wage policy would be welcomed by the adults participating in a labour market largely dominated by young participants. Due to the children's limited marginal productivity of labour (Patrinos and Psacharopoulos, 1997) and the displacement of adults' work (Admassie, 2003), the wage rate of the latter is likely to be lower[5] and their unemployment rate higher than the ones that would occur in an adult's only labour market. Therefore, the probability of adults' poverty is enhanced (Patrinos and Psacharopoulos, 1997). The effectiveness of a minimum wage policy in

[3] Patrinos and Psacharopoulos (1997) promote the controversial idea that it is indeed work that "… may help in the process of socialization, in building self-esteem and for training" (Patrinos and Psacharopoulos, 1997:388).

[4] It states that a pupil should not undertake "…any work that is likely to be hazardous…" (Article 32) while should be involved in "primary education compulsory and available free to all" (Article 28) (UN, 1989 cited in Gibbons *et al.*, 2003:1).

[5] Admassie (2003) reports that Bequelle and Boyden (1988) note that children earn less than adults even if both perform the same tasks and the former do not enjoy fringe benefits, insurance or social security payments. The latter income streams might constitute a sizeable percentage of the remuneration of the adults' labour and provide significant protection in case of unexpected unfavourable events.

limiting the extent of child labour is tied to the incidence of wage child labour. It is well known that children in developing countries are more likely to attend to household and farm chores (i.e., childminding, fetching water and wood or herding cattle, ploughing and seeding) than to work for a monetary or in kind wage.

The household economics literature frequently explains the children's participation to income generating activities using the luxury axiom. According to it if the non-child labour income falls significantly the household head will send the children in the household to work[6]. The extent of child labour can be contained by national governments deploying transfers to poor households to relax their budget constrain allowing more pupils to attend school without having to combine it with work. Additional schooling enhancing policies are those intended to reduce the opportunity and additional cost of education. They include the provision of good infrastructures, high quality schools and even child care initiatives. The latter are particularly important given that childminding is likely to compete directly with schooling time (i.e., to be carried out at a time when school is on and at home) while chores of the like of fetching water and wood compete for children's spare time (i.e., can be carried out on the way to or from school) (Admassie, 2003).
Moreover, the preference for child labour compared to schooling can be due to old parents failing to perceive correctly the importance of education for the pupils' development and the connected future returns (Mincer, 1974). In this vein, child labour can be seen as a practise promoting human capital dis-investment (Admassie, 2003) and perpetuating poverty in the future generations (Moser, 1996 cited in Ersado, 2005).

Gender bias is an additional problem which hampers many development countries. Because of this relevance, the United Nations places the provision of equal opportunities for both genders at the second place in the list of the *MDG*s. Despite recent progress in fostering gender equality, in several countries of Africa, South Asia and the Middle East, girls' access to education is still inferior compared to males' (Lewis and Lockheed, 2006 cited in Glick, 2008; Glick, 2008). This happens despite the common finding that female education guarantees, simultaneously, higher private

[6] The same axiom can be proposed for the schooling decision. In this case the child is going to school only if the household income is above the poverty threshold.

and social returns. Educated females will tend to have lower fertility, communicate health and sanitation knowledge to their children, and be keener on sending them to school (among others Schultz, 2002 cited in Glick, 2008). Likewise, the reduction in gender bias will raise the cohesion of the national population inducing higher female well-being, aspirations of increasing future income, lower poverty persistence and, possibly, the achievement of broader political rights. Gibbons *et al.* (2003) suggest choosing appropriate empirical measures so that the true extent of gender discrimination is captured in survey data and the policy recommendations are therefore more adequate. Culture and norms, religion and more "economic" reasons may have caused and perpetuated gender bias. The "economics of gender bias" can be due to a large extent to parents evaluating the pupils' future transfers to them, the chances of each child finding a suitable job or to marry a desirable spouse (Kamaruddin, 2006)[7]. The World Food Programme (WFP, 2001) attributes gender bias to the distance of schools from students' homes, lack of drinkable water and/or single gender toilets, the girls' contribution to domestic chores and the fathers' religious/social concerns that young females at school will be interacting with males, possibly of an older age.

The form of gender bias considered here supposes that the biased pupil takes part in economic activities that will sustain household income while the preferred one attends school.

This paper aims to identify policy variables which are correlated, in a statistically significant way, with schooling attendance and child labour in Morocco using cross-sectional data[8]. It will do so exploiting the theoretical model in Glick (2008) which provides an interesting neoclassic framework to deal with the adults' allocation of children's time to a combination of school, work and leisure. Because it explicitly allows for the differential treatment of the males and females' condition, it is believed to be particularly suitable to the investigation of gender bias. Empirically, it estimates

[7] For a formalization of the elderly insurance component of gender bias see the model in Glick (2008) or the discussion proposed in Section 2.

[8] The paper relies on some of the covariates most commonly used in studies of child labour and schooling. Part of the literature considers some of them as determinants of true causal relationships (Ersado, 2005). The paper will make clear which could and have been considered endogenous to the dependent variables. Because of the limited access to instrumental variables to solve all the econometric problems highlighted, the paper is "downgraded" to an analysis of statistically significant correlations.

two probabilistic models for schooling and child labour participation using a compendium of the *RHS* variables more commonly employed in the established literature. Moreover, data from the anthropometric section of the household survey are elaborated using a specialist software and dummies for the marital status of the household head are included to account for the presence of fragile household environments. The use of the same set of covariates in modelling school attendance and work participation aims at highlighting which variables affect each probability and determining the difference in magnitude for those significant in both. A statistical test supports the case for exploring the impact of the covariates across single gender models.

The paper is organised as follows. Section 1 summarizes the Glick (2008) model and discusses recent empirical probabilistic models; Section 2 reports the econometric approach implemented here; Section 3 describes the data and the covariates employed in the models; Section 4 interprets the results discussing the *marginal/impact effects* (henceforth *ME/IEs*, respectively); Section 5 summarizes the findings while Section 6 draws some policy implications.

1. Some insights into the issues

When setting out to investigate the characteristics of children's schooling attendance and working participation two major issues come to the fore and require careful handling. In the first instance, children's allocation of "disposable time" (i.e., all the hours in a day which are not reserved to sleep) is not completely in their hands. It is likely that either their parents or the head of the household, being pupils' main source of economic means and all-round care, play a decisive part in determining the final "optimal" allocation of time (Becker, 1974). Secondly, in achieving the "optimum"[9] the family (household) guided by its head is likely to behave as a sole entity composed of different individuals with distinctive needs.
Both issues are present in the model Glick (2008) compiles and which is believed to be proficiently employable in the present study.

[9] The equilibrium is optimal in the sense that it arises from the maximization of a particular utility function (see below) according to the traditional neoclassic founding hypothesis.

This model is preferred to the family/household ones proposed by Becker (among others 1974; 1976; 1981) and McElroy and Horney (1981) and Chiappori (1988).
The models in Becker (1974; 1976; 1981) appear to be unsuitable to be employed here because they largely resort on altruism in the models themselves. In Becker (1974) altruism is the behaviour by virtue of which the reduction in the transfers from the household head to one of the member does not change the distribution of resources among all the household members. A compensatory mechanism within the household will make sure that nobody experiences unpleasant feelings. This very feature of Becker's models seem to rule out the possibility of some household members experiencing inferior.
Likewise, the intra household allocation of resources achieved through a bargaining process is the main feature of the models in McElroy and Horney (1981) and Chiappori (1988). In these models, the final household equilibrium is obtained comparing the utility achieved in the household equilibrium and living alone outside the household[10]. These models would require the researcher to model the utility levels of children outside the household. Since the present paper does not model and define the "threat" points in a model *a la* McElroy and Horney (1981) and Chiappori (1988), the intra household bargaining models are disregarded to use the Glick (2008) model instead.

In fact, Glick (2008) seems particularly suitable to be used in empirical studies which want to estimate child schooling and labour participation accounting for the role of parents, the distinction between genders and the allocation of time to different activities. It is a two-period model of the parents investing in their sons' and daughters' education. The adults work in the first period to finance household consumption. In the second period they expect to live out of the children's direct transfers and wealth. Therefore, the parents' utility can be expressed as:

$$U = U_1(C_1) + U_2(C_2, W_g, W_b) \quad (1)$$

where C_t is the consumption at time *t* and W_g and W_b are the second period wealth of the female and male children respectively. First period parents' utility depends on

[10] Within models for marriage, the utility of the husband and wife living together as a family is contrasted with the utility both of them would experience in case they were divorced.

their contemporary consumption while the second period one is an indirect function of consumption through the transfers from their dependents and the genuine desire of having them enjoying higher wealth. In turn, children's wealth in period two depends on the investment in schooling early in life (S_i) and the experience accumulated in productive work (L_i) according to the following general formula:

$$W_i = W(S_i, L_i) \qquad i\text{=b, g} \tag{2}$$

According to equation (2) labour is a source of wealth and remunerable skills like schooling is. For this matter, the Glick (2008) model embodies the relevance of "child labour" postulated in Patrinos and Psacharopoulos (1997).

Supposing that parents do not have access to consumer credit, the first period consumption can be expressed as the contemporary income net of the schooling expenses:

$$C_1 = Y_p + Y_g\left(L_g\right) + Y_b(L_b) - P_s\, S_g - \; P_b S_b \tag{3}$$

where Y_p is the income of the parents, Y_g and Y_b are the contribution of the male and female pupils in the household to first period consumtion through their labour earnings (L_i) and P_i is the direct (monetary) cost of one unit of schooling which is allowed to vary across gender. Second period consumption depends on childrens' wealth (W_i) and the shares of "remittances" each pupil, according to her gender, pays back to the parents (r_i):

$$C_2 = r_b W_b + r_g\, W_g \tag{4}$$

The optimal quantity of education can be derived applying the usual maximization of (1), subject to the (2), (3), (4) and individual overall time constraint, with respect to S_i and L_i. Incidentally, the equilibrium will be characterized by the equality between the marginal benefits from and costs of education. A change in the relative prices of both consumption and investment goods, in the first period, will determine the actual opportunity cost of education allowing for a change in the optimal demand levels in equilibrium.

The model postulates an intrinsic trade-off between additional hours spent in class or at work. It could be argued that estimating two "single activity" (i.e., schooling and working probability only, respectively) probits (see section 2) and judging the incidence of opposite signs, across models and for the same variables, allows for gauging the presence or absence of the aforementioned trade-off.

Following Amin *et al.* (2006) it could be useful to remind that both child labour and school attendance can be measured as dichotomous variables expressing the probability of either conditions or as the number of hours dedicated to each activity. Dichotomous variables give rise to probabilistic models of the like presented here[11]. Using the number of hours spent in child labour and/or schooling would lead to OLS or Tobit based models. Finally, note that schooling participation lends itself to be analysed using the completed educational levels or years of attendance. This type of analysis can be carried out using econometric techniques for censored variables (i.e., survival analysis) or devising dedicated variables compatible with, for instance, OLS (for instance Patrinos and Psacharopoulos, 1997).

Works on Nepal (Dancer and Rammohan, 2006), Peru and Pakistan (Ray, 2000) and rural India (Drèze and Kingdon, 2001) are the leading examples of probabilistic models for schooling attendance considered here. Dancer and Rammohan (2006) estimate pooled and gender-specific models controlling for the effect of, among others, religion, wealth, income and whether the parents are earning their livelihood from being employed in the formal or informal sector. They find that household size and the age of both parents are the most relevant insignificant variables. Ray (2000) employs logit models[12] and finds that age and its square value, gender, working status, language, years of education of the most educated woman and community characteristics are relevant in both countries. In none the gender of the household head is significant. In Pakistan, poverty status, household size and a few wage variables are significant too. In Ray (2000), household size is captured by both the number of children and adults. The effect of an additional child is the reduction in the likelihood of attending school by the pupil in schooling age. On the contrary, one

[11] Amin *et al.* (2006) provides additional references to education and child labour probabilistic models.
[12] For a better appreciation of what follows it might be useful reminding that to compare logit and probit coefficients it is necessary to divide former by $\frac{\pi}{\sqrt{3}}$.

more adult in the household releases children's time so that they might allocate some of it to human capital accumulation. The effect of increasing household size by one child is compatible with gender bias against female pupils who are forced to childminding instead of going to school. Dancer and Rammohan (2006) and Ray (2000) both find that females are consistently are worse off than males in their pooled models.

The empirical literature has developed the probabilistic models to investigate school attendance across genders, localization areas or both of them. The present paper is concerned with the difference across gender but, for instance, Ray (2003) finds different coefficients across gender and settlement area in a child labour model for Ghana. A previous paper for Peru (Ray, 2000) highlighted the presence of gender bias only. Grimm (2002) estimates a probit for the permanence in school of both male and female children in Cote d'Ivoire. The localization dummies all display significant negative effects for both genders. Likewise, all but one (for the mother in the male model) of the coefficients for the completed schooling career are significant and are rising in magnitude. Surprisingly, the child of the household head suffers from a negative *IE*. In both Dancer and Rammohan (2006) gender specific models neither the father's age nor the mother's are significant. The father's education, the mother dummy for the higher one and all, but the second, wealth quintiles (in the male model) are significant in both models and foster attendance. The religion dummy and the mother being employed in paid work are the variables significant only in the male model. Likewise, the dummy for the mother possessing land, the mother dummy for primary education, the second wealth quintile, the number of children under five and the size of the household are significant in the female one. Note that the latter two effects have contrasting signs. This might confirm the gender bias against women in education as it happened in a very similar manner in Ray (2000). In Drèze and Kingdon (2001) the asset indicator raises female participation.

Psacharopoulos (1997) in a study on Bolivia and Venezuela and Ray (2000) on Peru and Pakistan estimate logit models for the probability of the child being employed. In both countries in Ray (2000), alongside the significance of several individual and household level demographical characteristics, the poverty status dummy, the gender and age of the household head are not significant. The number of adults in the household suggests the substitution of adults' work for children's. Child labour in

Peru seems tightly linked to the variables reporting the household's financial situation (i.e., expenditure per equivalent adult, the maximum wage earned by a male member and dummies for sewage treatment) through the luxury axiom. The first and second degree term in the wage earned by a female member and the dummy for bad water storage are the variables associated with the luxury axiom in Pakistan. Psacharopoulos (1997) is not looking for a non-linear relationship with age but includes dummies for gender, being indigenous having a female household head and a continuous measure for household income. It is interesting to note that all the covariates favour child labour. In the Venezuelan model, the urban dummy is a substitute for the racial one and is the only variable which curbs child labour. The marginal effects in this country are much smaller than those recorded for Bolivia.

At least to the author's knowledge, single gender probabilistic models for child labour are rare but Cockburn (2000) on Ethiopia is a useful reference. It originally employs the log of age to account for non-linear relationship in this variable; dummies for land ownership, fertility and slope of the plot; dummies for permanent crops and other assets plus the minutes required to fetch water. The model estimated on the female subsample achieves significance of the log of age and the number of younger boys only. Both increase girls' involvement in working activities. In the male subsample, the number of infants and of older boys; the number of oxen/bulls/hoes and the presence of permanent crops on the farm are significant in addition to those significant for females.

2. Econometric models for schooling and working

The present work employs the Glick (2008) model to define the theoretical framework for the analysis of child participation in education. Empirically, it estimates discrete response models for both probabilities and for both genders. The theoretical foundation of probabilistic models in terms of random utility functions can be found in the seminal work of Domencich and McFadden (1975). Despite the equilibrium originating from the Glick (2008) model is by definition optimal[13], the comments provided in this paper will imply that child school attendance is morally and ethically

[13] It is impossible to find a combination of schooling attendance, child labour and leisure time different from the optimum yielding a Pareto improvement in utility given that every equilibrium is Pareto efficient.

preferable to child labour. This will allow suggesting policies which diminish the probability of child labour while enhancing that of schooling[14].

Let $d_{i,1}$ be a dummy variable taking value one if a child goes to school and zero otherwise, $d_{i,2}$ a categorical variable expressing whether the pupil is involved in child labour, $\boldsymbol{w}_{i,k}^{'}$ $k = \{1,2\}$ the set of explanatory variables described in section 3 and $\varepsilon_{i,k}$ the error terms independent and identically distributed according to the normal distribution $N(0;1)$. The probit models for schooling and working attendance may be formalised as

$$\begin{aligned} d_{i,1}^{*} &= \boldsymbol{w}_{i,1}^{'}\theta_1 + \varepsilon_{i,1} \\ d_{i,2}^{*} &= \boldsymbol{w}_{i,2}^{'}\theta_2 + \varepsilon_{i,2} \end{aligned} \tag{5}$$

where $d_{i,1}^{*} \geq 0,\ d_{i,2}^{*} \geq 0$ are the latent variables associated to $d_{i,1} = 1$ and $d_{i,2} = 1$. According to Filmer (1999), it will be assumed that $d_{i,k}^{*}$ is the underlying demand for either schooling or working. Whenever either of them exceeds zero by any positive quantity, the respective dichotomous variables will be equal to 1. This approach reconciles probit models (i.e. discrete models) with the continuous nature of the levels of demand for both schooling and child labour attainable from developing the Glick (2008) model.

The system (5) does not consider the working and schooling decisions as being simultaneously determined. Likewise, it does not consider the pupil's working condition as completely exogenous. In the present paper, 13.38% of 5,357 children aged 7 to 15 not head of the household is idle, 9.46% is working while not attending school, 76.27% is studying while not working and a mere 0.88% is doing both activities. The negligible percentage associated to the last combination leads to the irrelevance of estimating a model where the two conditions are endogenous to each other. Nonetheless, to preserve the relevance of the decision process which allocates the pupil's time to schooling and/or work, the models are estimated using the same set of *RHS* covariates. This practise originates from the child labour literature (Grootaert and Patrinos, 1999). Since child labour is the activity which is likely to compete the

[14] Although it possible to record idle pupils (i.e., neither going to school nor going to work) the whole paper – for expositional purposes – will assume that a child not going to school would work and the opposite.

most with education for children's time, the models in (5) are expected to yield numerous variables with opposite sign across the two.

The set of *RHS* variables reported in section 3 is quite comprehensive but the extent of the omitted variable bias might still be relevant. For instance, failing to account for asset variables which are likely to have an effect on the marginal productivity of child work might prevent us from obtaining a statistically significant luxury hypothesis (Basu and Van, 1998 cited in Ray, 2000). This issue is highly relevant since an asset with intrinsic high productivity will raise household income (hence reducing poverty) which, in turn, is frequently a covariate which enhances enrolment. Cockburn (2000) considers the assets' contribution to the productivity of child labour a variable informing policy making. In fact, Cockburn (2000) recommends the implementation of a policy increasing the poor's access to productive assets to tackle the connected issues of child labour, school attendance and poverty when a market for child labour is missing.

Because of the relevant number of unobservable individual characteristics cross-sectional data cannot account for (i.e., the effect of talent (Ashenfelter and Rouse, 1998)), Beegle *et al.* (2004) warn that the findings of such econometric investigations should be interpreted as suggesting statistically significant correlations and not causal relationships. In the present paper, being unable to deal thoroughly with the possible endogenous nature of the household size, some within-household joint decisions, cost of schooling and the Body Mass Index *(BMI)* provides additional scope for embracing the aforementioned suggestion.

Model (5) evaluates the impact of a consumption measure on the probability that the children go to school or to work. It is likely that per capita consumption depends on the household members' allocation of time to productive or leisure activities. Moreover, expenditure - as well as income - is often subject to measurement errors arising from, for instance, self-employment activities or auto-consumption of the produce of the family farm (Bhalotra and Tzannatos, 2003). The use of an Instrumental Variable *(IV)* technique (Sudhanshu, 1999) to limit the impact of joint determination and measurement error bias is investigated in Appendix A. Since the tests upheld the exogeneity of consumption, Table 3,5,7 and 8 rely on the non-instrumented version of this variable.

Household size might be endogenous to the children's allocation of time through fertility choices (Bhalotra and Tzannatos, 2003). The latter can potentially give rise to a trade-off between quantity and quality of the pupils (Becker and Tomes, 1976 cited in Bhalotra and Tzannatos, 2003). It might be argued that the standard argument of endogenous fertility decisions does not apply to this model since the model does not consider parents but household heads only. Yet, the head's decision about the number of people belonging to the household might be jointly determined with, for instance, the square metres. In fact, it is possible that the household head wants to ensure a minimum level of per capita floor space and, in turn, decent living conditions. Econometrically, this variable would require *IV* which instead is not implemented due to the possible absence of suitable instruments and the need for demanding identifying restrictions. Therefore, the variable is supposed exogenous (Ray, 2003) but a "sensitivity analysis" is performed amending the present variable from the model. This practise does not induce significant changes in the schooling results while in the child labour model the coefficients related to wealth and income variables are affected, though seldom significantly.

The occupational status of the household head is potentially jointly determined with the probability of the children going to school or to work. It would be correct to exclude these variables from the specification only after having tested for the separability, within the household, of the decision-making process and having found that the independence of behaviours is upheld[15] (Bhalotra and Tzannatos, 2003). Neither the test for independence nor the *IV* estimation is deployed here but excluding these three dummies from the educational pooled-model did not have major effects on the significance and size of the coefficients. The age of the household head and the dummy for her having a Secondaire education became insignificant in the probit model for child work while the female household head became significant.

The expenditure for schooling purposes and the time that takes the child to get to school are variables which are endogenous to the pupil going to school. Both individual level variables are averaged over all the observations which belong to the same province to make them exogenous (Grootaert and Patrinos, 1999; Ray, 2003). The averaging at the provincial level removes endogeneity, maintains the analysis at a reasonable micro level and avoids collinearity with the regional dummies.

[15] For hints on separability refer to Appendix A.

It is well known that the probit estimates are interpretable solely in terms of standardized probit index (Reilly, 2007). To understand the results in probabilistic terms it is necessary to turn to the *ME/IEs* which may be quantified in *probability points (pob.p.)* or in *percentage points (per.p.)*[16]. Besides the difference between a probit index and a probabilistic interpretation of the results, it is necessary to choose between reporting on *ME/IEs* associated to significant *βs* or on statistically significant *ME/IEs* themselves. Conflicting evidence between the two approaches might arise[17]. In the current paper *ME/IEs* for significant *βs* are presented[18].

This work aims at identifying the *ME* for the variable age taking into account its first and second degree terms whenever both of them are significant. This effort requires the use of the following expression

$$\frac{\partial P_i}{\partial Age} = \left(\gamma_{age} + 2\gamma_{age^2}\,\overline{Age}\right) \cdot \phi(\overline{\boldsymbol{w}}) \tag{6}$$

where $\overline{\boldsymbol{w}}$ is the vector of the linear combination of the mean characteristics in the estimating sample and the probit coefficients, $\phi(\cdot)$ is the normal probability density function and $\overline{Age}$ is the mean value for the corresponding variable[19].

The need for two gender-specific models is tested econometrically transforming model (5) in a fully interacted specification (Mukamel *et al.,* 2002) as follows:

$$\begin{aligned} d^*_{i,1} &= \boldsymbol{x}'_{i,1}\beta_1 + \varepsilon_{i,1} \\ d^*_{i,2} &= \boldsymbol{x}'_{i,2}\beta_2 + \varepsilon_{i,2} \end{aligned} \tag{7}$$

where the covariates' vector $\boldsymbol{x}'_{i,k}$ is the partition of vector $\boldsymbol{w}'_{i,k}$ obtained by removing the gender dummy and multiplying what is found by the gender dummy. A Wald

[16] Henceforth only the abbreviation for *percentage point(s) (per.p.)* and *probability point(s) (prob.p.)* will be used.

[17] An example appears in Table 7 and Table 8 in Cockburn (2000).

[18] Moreover, the statement *"on average and ceteris paribus"* should complement each effect. For expositional convenience, it is always omitted.

[19] The author credits Dr. Barry Reilly for signalling this formulation. This expression reflects the traditional formulation of the *ME* ($\beta\phi(\overline{\boldsymbol{w}})$)**.** Nonetheless, given the original estimated model is of second degree in age, the combined *ME* is a linear combination of the "traditional" *ME* associated to a first degree variable and $2\,\beta_{age^2}\phi(\overline{\boldsymbol{w}})$ which corresponds to the second degree term evaluated at the mean of the age variable ($\overline{Age}$) as it is usually done in STATA.

Test[20] on the vector of interaction terms yielded significant results denoting the statistical difference of the results across genders. According to Glick *et al.* (2004) (footnote 25), because of the standardization of the variance of the error term carried out in probits and logits, model (7) yields the same results of estimating model (5) for the two genders separately. To make the presentation of the results more convenient, the present paper will estimate and present single-gender models.

3. Data

The Moroccan *Enquete Nationale sur les Niveaux de Vie des Menages*[21] *(ENNVM)* 1998/1999, carried out by the National Statistical Office assisted by the World Bank, is a nationally representative household survey which employs a two stages stratified sampling procedure. The Primary Sampling Units *(PSU)* are representative across rural and urban areas and reflect the different social classes in the society. Cartographic information and the National Census of the Population and Homes held in 1994 provided an universe of 1,500 *PSUs* from which 432 were drawn respecting stratification and base parameters criteria. The Secondary Sampling Units (*SSU*) are the households. For each *PSU*, 12 households are selected according to equal probabilities, giving rise to an expected final sample of 5,184 observations. Non-responsiveness and the inconsistency in some records drove the total number of usable household records down to 5,129. On the other hand, Vecchi (2001) warns that at the beginning of 2001 several sections of the survey are being checked for consistency to determine the soundness of the data.

The organization of the survey respects the traditional guidelines elaborated by Grosh and Glewwe (1996) and provides information regarding social mobility, housing conditions, energy supply and expenditure, education, health, employment status, transportation means, migration, fertility and anthropometric measures.

The sample for the schooling attendance model is composed by 4,957 observations while the one for child labour by 4,910.

[20] The traditional F test becomes a Wald test because of the correction for heteroscedasticity implemented throughout the work.

[21] An appropriate translation might be *National Survey of Household Living Standards*.

The data for pooled and gender-specific models are defined and described in Table 2 using averages and standard deviations in parenthesis when appropriate. These variables were selected to minimize the extent of multicollinearity in the *RHS* using a cut-off point of 0.3 for the Spearman Rank Correlation[22].

TABLE 2 ABOUT HERE

The dependent variable is a dummy for individuals 7 to 15 years old currently at school, for the educational model, or currently at work, for the working status model. Due to the survey's limitations these models could not be casted employing, for instance, the number of hours spent in either school or work like in tobits or two stage Heckman OLS models. The definition of child employed here is consistent with the classification employed in World Bank (2001a) and largely overlaps with the one commonly used for child labour studies (Gibbons *et al.*, 2003). Since the model uses the head of the household's characteristics as explanatory variables, the only child who is also head of the household is excluded from the sample. This practise is believed to introduce a negligible bias.

The section of the household questionnaire reporting the biometric data for the individual is employed to calculate the children's *BMI*. This characteristic is included since once in school, "[a] healthy child is more able to attend class attentively, is less likely to miss class due to illness and as a result […] to repeat grade" (Ayalew, 2000:2). Moreover, it is a proxy for the household per capita wealth and long term well-being.

Despite the specialized literature prefers the *height to age z-scores (HAZ)* and the *weight to age ratios (WAZ)* to the *BMI* to describe the pupils' nutritional condition (WHO, 1986 cited in Gorstein *et al.*, 1994:273), the latter measure is employed here. The preference for *BMI* stands with the age of the individual in month, necessary to calculate *HAZ* and *WAZ* but not *BMI* using the ANTHRO software[23] (Gorstein and Sullivan, 1999), being unavailable in the biometric section. This choice should avoid

[22] Principal Component Analysis *(PCA)* (see Ruel *et al*. (1999) for an application and StatSoft (2007) for technical insights) is an alternative method for purging collinearity yielding equivalent, or even superior.

[23] ANTHRO software, [on line], available at <http://www.cdc.gov/nccdphp/dnpa/growthcharts/anthro.htm>.

the occurrence of a "substantial systematic bias" in the *HAZ* and *WAZ* (Gorstein, 1989 cited in Gorstein *et al.*, 1994:275).

The paper relies on describing children's relationship with the head of the household since tracing parents in a consistent way throughout the survey proved impossible (Vecchi, 2001) [24].
The proportion of female children in schooling age out of the total number of pupils in the household is included to capture the competition - within the household - over scarce resources devoted to education. Moreover, according to Dancer and Rammohan (2006) it captures the extent of gender bias when

> " […] for a given family size, it must be the case that a male child, growing up in a household with only brothers, may have fewer resources than if he were to grow up with sisters only" (Dancer and Rammohan, 2006:12).

Instead, the household size denotes the competition over "multiple ends" resources (Grootaert and Patrinos, 1999).

The gender of the household head is used to test whether, as reported for instance by Unni (1998) cited in Dancer and Rammohan (2006), female household heads are keener on sending their children to school when compared to male household heads. The estimation of gender-specific models will provide results useful to test whether female heads, by favouring pupils of their same sex, contribute to closing down the gender gap against women (Jayachandran, 1997 cited in Drèze and Kingdon, 1999).

The household head's highest diploma is a proxy for the educational attainment of the parents which the specialized literature has proved to be one of the major determinants of children's enrolment (among others Drèze and Kingdon (2001)). The statistical significance of a positive coefficient for this variable could initiate an intergenerational valuing and maximization of the private rate of return from pupils' education (Francavilla and Lyon, 2002) while providing the society with some of the public returns associated to it (i.e., adequate health and social consciousness). Instead,

[24] Throughout the whole work, those of the household head will substitute the variables describing parents' characteristics.

Parsons (1975) considers this same variable a determinant of the willingness to subsidize children's education transferring to them part of the adults' wealth.
The occupational status of the household head could affect the other household members' allocation of time. A priori there might be complementarity or substitution between the adults' and children working conditions. Complementarity would occur if the household head and the children are both working. Substitution would mean that if the household head is employed the children will have higher probability of schooling. Basu and Van (1998), as cited in Ray (2000), test this proposition evaluating the significance of these dummies.

Francesconi *et al.* (2005), who analysed the consequences of growing up in a fragile family environment on educational attainment in Germany, inspired the inclusion of the marital status of the household head. The age of the household head is included to proxy her inclination towards education. In Morocco 9.30% of the non-attendance cases are associated to parental disbelief in the importance of schooling. Chernichovsky (1985) reports that Ashton (1945) believed the same phenomenon occurred in Botswana. Likewise, Admassie (2003) notes that in Ethiopia parents are very uncertain about whether formal education grants higher rates of return compared to on the job training. Moreover, they are reticent to provide equal educational opportunities to boys and girls because the former will remain in the family lineage and are more likely to assist the elderly while the latter will abandon it. The assumption for this variable is that the older the household head the lower the probability of school attendance, the higher the one of working.

The indirect cost of education are captured, in the present model, by the average, at the provincial level, of the distance from school in minutes. Time distance is preferred to kilometres since it captures the nature of the terrain encountered *en route* and is a proxy for the development of public infrastructures such as roads, transportation and traffic management systems. The direct cost of education is the log of the mean, at the provincial level, of the total expenditure for schooling purposes. The total expenditure includes schooling fees[25], clothing, material, accommodation, transportation, extra

[25] Both for public and private schools.

courses and unexpected expenses in the last twelve months[26]. Pecuniary costs of schooling are relevant in Morocco, according to World Bank (2001b), because "[a]lthough education is free, the 1998/1999 *LSMS* confirms that families incur non-negligible out of pocket costs" (World Bank, 2001b:47). In this condition the poor's access to education can be heavily undermined. In Ray (2003) this variable was used as a proxy for school quality. This interpretation is debatable since it is difficult to distinguish, from the data, whether higher expenditure was induced by a better institution rather than an idiosyncratic household head's willingness to spend on children's schooling equipment or quality.

Household expenditure, the number of square metres the household occupies and the type of possession right on their dwelling are the variables which denote the impact of financial adequacy on children's schooling and working probabilities. Since in Morocco 8.87% of the households share living spaces the question on the number of square metres excluded common areas such as balconies and courtyards (Royaume du Maroc, 1997). According to the Cockburn (2000) analysis of the asset variables, it might be argued that dwelling characteristics might capture the child involvement in housekeeping chores.

Note that the literature usually employs parental characteristics while this paper uses the household head ones. This will require an approximation procedure when commenting on the *IE* for the presence of a female household head and making cross-country comparisons with the surveyed literature. The difference in size of the *βs/ME(IE)s* for the education of the mother in the available single gender models will achieve this goal.
Table 1 describes the expected effects of the model's covariates on the children's probability of going to school or work. They are to be intended as the foreseeable changes in the probabilities due to a rise in the explanatory variables.

TABLE 1 ABOUT HERE

[26] The aggregate measure was created considering the missing values in each component as zeros.

4. On the interpretation of the results

The interpretation of the results attempts at comparing the Moroccan findings with the reference literature and at highlighting instances of conflicts with the established "priors" presented in Table 1.

Across all the estimated models, the descending ranking of the *IEs* for the dummies for the relationship with the household head is consistent with its prior and reads as follows: child, grandchild, other relationships with the household head, sibling and being a son/daughter-in-law of the head. Due to this regularity, this variable will not appear in the comments for any model.

4.1. School attendance

TABLE 3 ABOUT HERE

The *ME/IEs* for all the significant covariates, but the primary education level, in Dancer and Rammohan (2006) are bigger (at least in absolute terms) than the ones for Morocco.

The relationship between $d_{i,1}$ and age is a concave downward parabola. The maxima, and the age spans on which the current and reference models were estimated appear in Table 4. The Moroccan *MEs* (for the first and second degree) lie between those in Drèze and Kingdon (2001) and Dancer and Rammohan (2006). Equation (6) yields a negative *ME* of -0.0157. Therefore, inducing an infinitesimal change in age above the sample average causes the probability of attending school to decline by 1.57 *per.p.*

Consistently with less developed and Muslim countries' evidence, being a male grants a higher probability of going to school by 13.92 *per.p.*, compared to a female. In Dancer and Rammohan (2006) gender bias against females is three times the one in Morocco while in Drèze and Kingdon (2001) is two *per.p.* lower than in Morocco. This evidence supports the development of a gender specific model which follows.

A 5% rise in the *BMI* induces a decline in schooling participation by 0.032 of a *per.p.* Accordiong to this result, the school feeding programme that Morocco has been

employing "since the early '70s" (WFP, 2001:6), which includes take–home ration[27] targeted to rural females, seems to have yielded an undesirable results. A tentative interpretation for this surprising finding is that a healthy body is crucial in working activities rather than cognitive ones. This hypothesis will be verified looking at the significance and sign of this same variable in the child labour model.

Pupils living in a household whose head is female have a higher probability of schooling, compared to a male head, by 4.70 *per.p.* This outcome conforms to, among others, Unni (1998). Since male household heads are deemed to support child labour, further comments on the coefficient linking head–pupil of the same gender are postponed after the estimation of the child labour model. In Drèze and Kingdon (2001), the effect of mother's literacy on children's school attendance is more than ten times the father's. In Dancer and Rammohan (2006), the father records larger positive *IEs* than the mother's.

Residing with a household head that has a diploma Fondamental grants the pupil a higher probability of going to school by 9.30 *per.p.*, compared to the condition he or she would experience under an illiterate head. It can be argued that "decreasing marginal returns from the head's education" are present and are due to the head's diploma Secondaire increasing the child schooling probability less than the Fondamental. This occurrence is consistent with most of the literature that underlines the importance – in underdeveloped countries – of the basic literacy enjoyed by authoritative people in the house. Nonetheless, it conflicts with the international evidence taken into account here. In fact, in Nepal "increasing returns" to both fathers and mothers' education are present. Moreover, the *IEs* are larger for the father than the mother. In Drèze and Kingdon (2001) household head's education is measured by attended years and *MEs* are roughly ten times smaller than the Moroccan *IEs*[28]. In Ray (2000) a similar effect is measured by the number of years of education of the most cultured female. Considering the different nature of the variables, the Peruvian β equates circa half the Moroccan's while the Pakistani is more than a tenth.

[27] Girls attending school regularly used to "receive a ration of 100 kilograms of wheat and 10 litres of vegetable oil per year, distributed in two instalments. This is equivalent to approximately one or two monthly incomes of a typical beneficiary family, or between 1.5 and four monthly salaries of a girl working as a domestic helper in a Moroccan city" (WFP, 2001:6).

[28] This result may be explained by relying on the different nature of the continuous and dummy variables.

A 5% increase in both expenditure and square metres triggers an improvement in the attendance probability by 0.19% and 0.105 of a *per.p.*, respectively. These two *MEs* are in agreement and complement the information provided by the indigence *IE* in supporting the luxury hypothesis. Interpreting the Moroccan results for the asset variable according to Cockburn (2000), it displays decreasing child-labour productivity in household chores. In Dancer and Rammohan (2006), a twofold phenomenon occurs: the four wealth quintiles display a positive impact on pupil's attendance while their interaction with the dummy for the son has negative effects. In Drèze and Kingdon (2001), the *ME* on the asset index[29] induces a rise in attendance, which is ten times smaller than the *ME* on square metres in Morocco.

4.2. Gender-specific models for educational attendance[30]

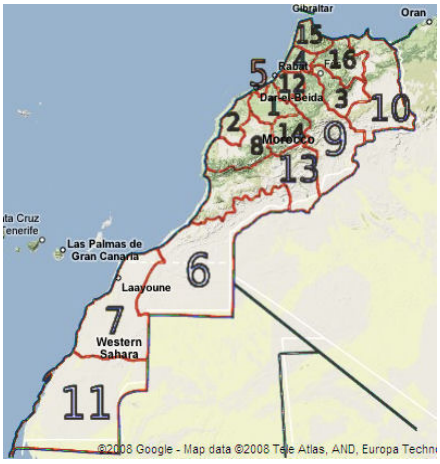
TABLE 5 ABOUT HERE

Among the variables significant uniquely in the male model, being located in the regions 4, 8, 3 and 15 in Figure 1 is associated with a lower probability of being at school compared to a pupil of the same gender living in Oued Ed-Dahab-Lagouira (region 11 in the map).

[29] Interpreting the asset index as a continuous variable does not seem particularly worrying.

[30] The presentation of the gender specific results hereafter (and the related policy implication drawn in Section 6) are likely to appear as implying that if a variable is significant in the female model and not in the male one, inducing a change in that variable might reduce gender bias reducing the differences in the probability of going to school/work male and female pupils face. Glick (2008) (footnote 12) notes that despite it being a common practise in applied research it is not a statistically sound one (i.e., methods like difference-in-difference regression or the comparison in the probabilistic effect carried out in Glick *et al.* (2004) (Appendix 2.2) should be used). This paper as well as Glick (2008) follows the established convention. The use of the Glick *et al.* (2004) method of evaluating the relative gender responsiveness of child labour and schooling participation to the change in the models' *RHS* variables is left as a future research effort.

Figure 1 Moroccan regions on a terrain map



Source: author's elaboration on Google (2008) and Wikipedia (2008)

All the significant regions except number 3 have access to the sea. Therefore, it is possible to imagine that the pupils might be involved in some activities related to the fishing or commercial industry. Despite child labour not being a perfect substitute for child school attendance, it can be the most likely and preferred outside option. The dummy for region 3, is likely to pick up characteristics of the difficult terrain encountered on the way to school which is not fully captured by the variable expressing the duration of the journey.

An infinitesimal increase in the age of the household head reduces a male schoolchild's chance of attendance by 0.0013 of a *prob.p.* The negative attitude of an old household head is likely to be strongly determined by her lack of any completed education, being out of the reach of modern media and left out of government literacy programmes.

Instead, raising by 5% the yearly per capita expenditure increases the male attendance probability by 0.235%.

The dummies for poverty condition, female leadership of the household, the household head holding a Secondaire diploma, the variable for the household size and the provincial average time to school are the variables which affect only female pupils in Morocco.

The present evidence respects the findings in Dancer and Rammohan (2006) and Drèze and Kingdon (2001) where mother's education compensates for gender bias against female pupils. If a woman leads the household, female students have a higher probability of being in school - compared to their condition under a male head - by

8.76 *per.p.* In Dancer and Rammohan (2006) the *IE* on girls' school attendance of the mother's completion of secondary education is almost 2.5 times the effect of the same variable on males' attendance. In Drèze and Kingdon (2001), the father's education improves boys' chances while girls benefit from the one of both parents. Nonetheless, the *ME* for mothers exceeds the father's by 0.5 of a *per.p.* In Grimm (2002) mothers' education induces βs for female students which are almost twice as big as those for males while fathers' does not play any significant role. Surprisingly, the dummy for mothers' secondary education or above induces higher schooling attendance probability for males compared to females.

Despite the Secondaire diploma being significant, "declining marginal returns to education" arise since the *IE* associated to this diploma for a female pupil is 3.6 *per.p.* lower than the one associated to the Fondamental.

The household size supports the existence of a significant gender bias since, according to the Cameron and Trivedi (2005:488-9) methodology, the increase of household size by one unit diminishes female probability of schooling by 0.76 of a *per.p*[31]. In Dancer and Rammohan (2006) the size of the household fosters female attendance.

The physical effort required to cover long distances between home and school in a tough natural environment is likely to explain the finding that increasing the travelling time by 5%, the probability of a female girl being at school falls by 0.05 of a *per.p.*

The remainder of this subsection will concern variables which are significant for both genders.

The coefficient for age and age square are larger, in absolute value, for females. The maxima in the parabolic relationships between schooling probability and age appear in Table 4. The result for Morocco is consistent with both the findings of the respective pooled-model and the presence of gender bias against women due to the steeper decline in probability of attending school for females. According to equation (6), an infinitesimal change in a male's age, above the sample average, causes a fall in the attendance probability by 0.35 of a *per.p.* For females, the reduction in schooling probability is 3.46 *per.p.* The *MEs* in Dancer and Rammohan (2006) for both age and age square are similar across gender and in line with the pooled-model's ones. The negligible difference in the single-gender *MEs* that Drèze and Kingdon (2001)

[31] Because this variable varies by one unit at time the correct effect is the "exact unit change" and happens to be quite close to corresponding *ME*.

estimate for India is particularly surprising due to the country's reputation of opposing female education. This should be particularly the case in states, as Bihar, Madhya Pradesh, Rajasthan and Uttar Pradesh, which record particularly low attendance rates and are the main focus in Drèze and Kingdon (2001).

Improvements in nutritional status are more detrimental to women's probability of going to school than to men's. A 5% increase in the *BMI* reduces the schooling participation probability by 0.015 and 0.0575 of a *per.p.* for males and females, respectively. These results reinforce the findings of the pooled model for schooling.

A 5% increase in the square metres available to the household causes females to have higher probability of school attendance by 0.187 of a *per.p.* The same improvement enhances males' chances by 0.047 of a *per.p.* In Drèze and Kingdon (2001) the asset indicator raises female participation, only.

The strongest effect for the highest diploma held by the household head corresponds always to the Fondamental one. A household head having this certificate is associated with a female pupil having a higher probability of schooling by 0.1677 *prob.p.* compared to living with a household head without any diploma. In the male case, the *IE* denotes a higher schooling likelihood by 0.0403 *prob.p.* The trend involving the marginal returns from education is maintained when moving from pooled to gender specific models both in Morocco and in Dancer and Rammohan (2006). In Grimm (2002), all but one (for the mother in the male model) coefficients for the completed schooling career are significant and are rising in magnitude. In Drèze and Kingdon (2001), the father's education *ME* in the girls probit is slightly more than three times the one in the male model. Urban settlement and the relationships with the household head in Morocco favour more female school attendance than males' one.

4.3. Estimating a model for child labour

TABLE 7 ABOUT HERE[32]

The comments to the *ME/IMs* will attempt to highlight the differences with the previous pooled and the gender-specific models. The statistically significant dummies for the household head's education are many more in the working condition rather than in the school attendance model. The *IEs* they originate are fairly homogeneous

[32] Please refer to the appropriate section of the appendix for information on the estimation problems and their solutions.

across the head's diplomas such that the returns from the head's education might be deemed constant.

The relationship between the dummy for being at work and age is linear. An infinitesimal change in age raises the probability of being employed by 1.43 *per.p.* The Moroccan results lie between those calculated for the two models in Psacharopoulos (1997) where both probability curves are downward parabolas, though. The Peruvian peaks at 17.87 years while the Pakistani at 17.85. Note that the two maxima happen to be very close to each other despite the likely differences in economic development, legislations, attitude toward child labour in the countries and the definition of children employed in these two studies.
Being male entails a lower probability of employment compared to a female *"other things being equal"* by 1.26 *per.p.* This is a result compatible with the presence of gender bias in education against women. Likewise, the reviewed empirical evidence reports that males appear to be more involved in work because domestic chores are commonly excluded from the surveyed declinations of child work. Living in an urban – rather than rural – settlement diminishes the probability of working by 14.63 *per.p.* The present coefficient provides complementary information to the very same one in Table 3 and is consistent with the international evidence.

The significant coefficients for regional settlement suggest a reduction in the working probability compared to the omitted region. This phenomenon might be explained assuming that these very same regions suffer from particularly depressed economic conditions. This argument might hold for region number 13, 10 and 9 since, according to Figure 1 (page 18), they seem widely dominated by natural conditions likely to prevent the fishing or agricultural activity. The former is prohibited in landlocked regions while the latter activity is distressed by the presence of the Atlantis mountains and the desert. On the other hand, it might be argued that the better natural conditions in region 2 and 12, compared to the omitted one, raise the level of per-capita household consumption relaxing the household budget constraint reducing the luxurious nature of children's spare or educational time.
A 5% rise in the *BMI* boosts the probability of working by 0.01 of a *per.p.* This result confirms the hypothesis developed, after estimating the model for education, that substantial physical capabilities are needed in activities that are likely to be manual

and highly effort-demanding. This occurrence seems to be a Moroccan peculiarity since a similar result is absent in Ray (2000).

A unit change in family size increases the probability of going to work, for a youngster aged seven to fifteen, by 0.36 of a *per.p.* This probabilistic effect denotes the presence of constraints and competition over available resources among the household members. The Moroccan β and the "standardized" logit coefficient for the Venezuelan model in Psacharopoulos (1997) are close in magnitude and of the same sign. The two coefficients in Ray (2000) look remarkably similar and, once transformed, are in absolute value 33% larger than the Moroccan β for the household size. The education of the household head curbs child labour in Morocco and the associated βs are 10 times bigger than those converted, for both countries, in Ray (2000).

Living with a household head who is employed boosts a pupil's probability of employment by 1.70 *per.p.* compared to the excluded category[33]. Therefore, the "less than optimal" test for the separability, within the household, of the working decision[34] supports complementarity.

An infinitesimal increase in the age of the household head diminishes the probability of going to work by 0.27 of a *per.p.* and generates an unexpected result. A 5% rise in the provincial average time taken to go to school raises the opportunity cost of attendance by 0.002 of a *per.p*. This is consistent with the expectation that a cost surge, above economic convenience, is likely to induce a substitution of other activities for school. Among these work is the most likely. A 5% rise in the square metres available diminishes the children's working probability by 0.019 of a *per.p.*, confirms the luxury axiom and suggests that house-based asset variables report on the decreasing marginal productivity of a child involved in housekeeping.

All the dummies for the possession right of the dwelling are associated with a higher probability of child labour. Nonetheless, the ownership induces the smallest increase in probability since it surges by 3.23 *per.p.* while renting or occupying the house "for

[33] It is possible that this result is genuinely spurious. The significance of the dummy for the household being employed may arise from it being the only variable for working condition left in the model after the one for unemployment was dropped due to perfect classification.

[34] This attempt is defined "less than optimal" because it neglects several other relevant issues which should be taken into account in a test like this. A dedicated example is Bhalotra (2006).

free" raises it by 5.91 and 5.55 *per.p.*, respectively, compared to "other rights". Dwelling ownership is the right which is the likeliest to originate a wealth effect which, in turn, could relax the household budget constraint. The stronger the wealth effect, the smaller the marginal returns from the contribution of the children to the household budget and, in turn, from child labour. According to this interpretation, ownership shows a strong wealth effect by means of increasing the probability of child work very little. On the other hand, renting is the tenancy agreement which is associated with the highest increase in the probability of child labour.

The weak wealth effect arising from occupying a dwelling for free produces a rise in child labour probability. Therefore, there are incentives towards higher working engagement which exceed the curbing effect brought about by the availability of spare money freed up by this peculiar tenancy agreement and, allegedly, devoted to conspicuous consumption which need to be funded[35].

Inducing a 5% rise in the per capita yearly expenditure boosts the probability of being employed by 0.08%. It is possible that the higher the yearly expenditure, the higher the share devoted to conspicuous consumption[36] and, in turn, the higher the likelihood of children working to contribute to the household budget.

4.4. Gender-specific working condition models

TABLE 8 ABOUT HERE[37]

Among the variables significant only in the male sample, being settled in Fes-Boulemane raises the probability of child work by 5.93 *per.p.*, compared to living in Oued Ed-Dahab-Lagouira. Region 3 is a landlocked mountainous region located in the north of the country but with a local economy more thriving than the one in the reference region, which is deserted and geopolitically unstable[38].

[35] To avoid that this argument brings about reverse causality it is necessary to postulate that the consumption effects captured by the tenancy agreements are not fully captured by the consumption variable.

[36] The positive sign of this *ME* may be interpreted as suggesting reverse causality i.e. the level of per capita consumption being affected by the number of active people in the household, hence by the probability of children being involved in child labour. The determination of the "true", if any, causality direction is not addressed in this paper.

[37] Problems in estimating these models are reported in the appropriate section of Appendix A.

[38] Region number 6 (Guelmim-Es Semara), 7 (Laâyoune-Boujdour) and 11 (Oued Ed Dahab-Lagouira) are territories contended between the Kingdom of Morocco and the Polisario front which claims this territory as part of the Sahrawi Arab Democratic Republic (Wikipedia, 2008).

Poverty is associated with child work through the luxury hypothesis. Similarly, inducing a 5% increase in the *BMI*, a boy has higher probability of working by 0.009 of a *per.p.*

An infinitesimal increase in the proportion of pupils in schooling age reduces the probability of a male being working by 0.63 of a *per.p.* This might require the female schoolchildren in the same household to work more to compensate for the lower masculine effort. This is somewhat confirmed by noting that the female predicted probability of working is higher than male is. In Cockburn (2000), the probabilistic effects of a higher number of infants and older boys are contrasting in sign. The former fosters work participation by 2.3 *per.p.* while the latter reduces it by 0.4. This figure is quite comparable with the Moroccan one.

Recall that the effect of a female household head was a surge in the attendance chances for youngsters and girls, in particular. Consequently, it is quite surprising that this covariate influences males' opportunities only when estimating child labour gender-specific models. In fact, living in a household whose head is female diminishes the male probability of working by 2.21 *per.p.* According to the Cameron and Trivedi (2005:488-9) formulation of the unit change probabilistic effect, increasing the household size by one member raises the probability of a young man being employed by 0.39 of a *per.p.*

If the household head is married, boys have a higher probability of being at work by 1.24 *per.p.* compared to when the head is single. If she were a widow(er), the difference in chances of being working would be 0.3804 *prob.p.*, compared to the base category.

Raising the "time-distance from school" by 5% boosts the probability of child work by 0.006 of a *per.p.* Finally, living in a free house increases the chances, for a male aged seven to fifteen, of being at work by 0.0408 *prob.p.* while a 5% increase in household living space diminishes it by 0.021 of a *per.p.* The *IE* for living in a house for free is consistent with the tenancy agreement inducing higher consumption of goods and, in turn, requiring more people to help financing the budget rather than letting pupils enjoy their spare time or attend formal education.

The female probability of working is concave with respect to age and the minimum is located at 17.55 years. Employing equation (6), an infinitesimal increase in individual age, above the sample average, raises the probability of working by 3.50 *per.p.* The

positive *ME* is due to the average age, in the female sample, being smaller than the value recorded at the turning point.

Additional variables significant only for females are the ones for living in region 6, 13, 2 and 9 in Figure 1 (page 23). They cause the probability of being at work for a female child to be lower by 0.0250, 0.0252, 0.0255 and 0.0305 of a *prob.p.* compared to living in the omitted region, respectively. The numeric impacts are all quite close to each other. The reduction in the working probability recorded in region 6, 13 and 9, compared to region 11, can be associated to the presence of the desert and absence of access to the sea (region 9). Region 2 produces a counterintuitive *IE* since it should be a region with low land and access to the sea (i.e., providing good business condtions). In turn, children could end up supplying some of the labour required locally in business prone regions. According to this argument, it is possible that this counterintuitive result is due to child work under-reporting.

A female pupil living with a household head with a Secondaire Diploma has a lower probability of going to work by 10.99 *per.p.*, compared to living with an illiterate head. A 5% increase in the yearly per capita expenditure raises the probability of being working by 0.1065%.

The *ME/IEs* associated to variables significant in both genders are greater for the female model. For instance, the *IE* for a female living in an urban area is more than double the males' and associated to a smaller incidence of child labour. A female pupil settled in the Oriental region has a lower probability of being at work by 3.29 *per.p.* compared to residing in the omitted region. Men's differential is minus 1.78 *per.p.*

The *IEs* associated to the Diploma Fondamental are quite similar across genders. In fact, a female aged seven to fifteen living with a head with such a diploma has a lower likelihood of going to work by 0.0168 *prob.p.* compared to the reference dummy. For a male with the same characteristics, the differential is 0.0152 *prob.p.*

In both gender models, it is evident that there is complementarity between the adults and children's choices of participating in the labour market. In fact if the head is employed, a female pupil has a higher working probability by 1.81 *per.p* compared to living with an inactive head. A male has a higher likelihood by 1.44 *per.p.*, instead.

Owning the place where the household lives causes an increase in the working probability, compared to "other" possession rights, by 3.57 *per.p.* in the female model while in the male model the surge is 2.13 *per.p.*

5. Summary

The maxima in the models for the probability of going to school are consistent with the agents' optimizing behaviour postulated in the two periods models for the optimal accumulation of human capital. According to Azzi and Ehrenberg (1975), concentrating human capital accumulation in the early stages of an individual's life is a rational behaviour which will grant the highest returns for a longer time span compared to studying later in life. The better nourished a pupil is (i.e., the higher the *BMI*) the more likely he/she is to be out of school. In fact, a well nourished body seems to be better employed at work than at school. The relationship between the household head and pupil, the urban or rural localization and gender are the variables causing the most significant changes in schooling probabilities. The sizeable link between adults and pupils testifies the importance of the intergenerational benefits of policies which promote education even when school attendance is heavily impeded. Nonetheless, it is striking that this impulse gets transmitted with decreasing marginal returns from the education of the household head. In fact, in countries with low average education levels, it would be expected that the heads of the household who are highly literate would urge the pupils they care for to "consume" ever increasing quantities of formal education.

The squared term in age in all the models presented above denotes that – beyond the probability maximizing point – the females' enrolment chances decline at a pace ten times the males'. A female-specific cause for low schooling attendance, beside child work (which is likely to take the form of childminding), is the occurrence of an early pregnancy and the associated stigma of being "a bad example for the students" (Fentiman *et al.*, 1999:345) when going back to school.

The comparison across genders and countries of the age level which maximizes the probability of schooling attendance provides the surprising result that India records the smallest distance between males and females. In this special ranking, Nepal is second - since male maximise their probability 1.72 years after females - and Morocco is third due to the difference in favour of men stretching to 1.93. Additional

covariates, which stress the female inferior condition, are the poverty status (both in terms of monetary and nutritional adequacy), the family size and the distance from school. Surprisingly, the other *ME/IEs* associated to significant βs seem to favour markedly female – rather than male – prospective students.

As expected the model for child labour displays most of the coefficients with opposite sign compared to the schooling one. This occurrence could be interpreted as a sign of a degree of substitution – between the time being allocated to schooling and work – close to one. The tentative nature of the explanation is justified by the models presented here not explicitly accounting for any "simultaneity" in the pupils' time allocation between school and work. The decision of approaching "simultaneity" using an indirect technique is due to more complex and appropriate models not fitting the fragile nature of the Moroccan dataset. The age of the household head and the per capita yearly expenditure stand out for the peculiar estimated betas. Characteristics proxied by the household head's age are negatively correlated with both children's schooling and working. The significance of the per capita yearly expenditure might be due to reverse causality, especially in the child work model. The allocation of pupil's time (i.e., going or not to school/work) might have a remarkable impact on the household expenditure budget or wealth of households which face asset or income constraints. The occurrence of a linear, as opposed to concave, relationship between the dummy for working status and age may be due to the 7-15 age range used in these models. In this span, a child has already experienced some schooling such that a non-monotonic probability of school attendance is conceivable. If a pupil is marginally or not engaged in working, a concave parabolic curve for the probability of being employed should be unlikely to occur.

The significance of some regional dummies in the working model as opposed to none for school attendance might be caused by different role played by localization incentives across the two models. On the one hand, production activities are likely to be highly "location intensive". On the other, sound education policies may want to scatter the education facilities efficiently throughout the country. The regions which come up significant are largely coastal or "agriculture-friendly". Nonetheless, these two characteristics seem associated with an unexpected decline in the probability of child labour. A variable, which is relevant solely in the child labour model, is the household head being employed. Because of the complementarity between the pupils'

and the heads' working status, the children in the household are likely to suffer from a detrimental "intergenerational" effect which limits their human capital accumulation. Unfortunately, the insignificance of this same variable in the attendance model makes the interpretation of this phenomenon somewhat incomplete.

Female gender-specific *ME*/*IEs* in the child labour model are only double the male ones. In the schooling attendance model, they averaged roughly three times the male. The concavity in age is verified for the female model while in the male case no co-variation employment–age is present. Juvenile pregnancies occurring at the start of a female's working career are likely to undermine her chances of long term job tenure. The lack of any connection between a male's age and his probability of being working is an unexpected and fairly inexplicable result. The regional dummies are more frequently significant in the female working condition model vis-à-vis any male gender-specific model. Poverty is connected to male child labour while it used to be linked to females in the educational model. This might be a confirmation of the luxury hypothesis and gender bias. It reaffirms that provided the household is poor every member's contribution to the common budget is required. When the poverty threshold has been overcome, the male pupils are likely to drop out of work and go back in class. Likewise, females have fewer opportunities and might be stuck at work. Among the relationships with the household head, being his/her son is the condition associated to the largest reduction in child labour. The second largest similar effect accrues to being a widow of the household head. This result could be somewhat spurious given the high number of widows in the survey. The latter phenomenon is caused by the respondents' preference to be classified in this way instead of being recorded as divorced (Royaume du Maroc, 2007). The wealth and income variables present opposite signs in the model for male child labour. In the female specification, both variables are connected with a rise in the working probability. A female household head promotes the education of pupils of her same gender but in the child labour model she removes male children from work increasing their chances of schooling attendance. It appears that both gender-specific models find some complementarity between household heads and children's working conditions.

Future research on this topic would employed in such econometric estimations more carefully to minimize the possibility of inducing endogeneity. The investigation of

separability and the bargaining power in the household decision making process could be two extensions to the current framework to be undertaken both theoretically (McElroy and Horney, 1981) and empirically. In the latter case, a robust and suitable dataset could provide the basis for the estimation of a bivariate or simultaneous model. Probably the fiercest criticism of the present work concerns the extent of perfect classification which is due to the high number of dummies employed in estimation. A more pragmatic approach would have reduced their number. This would have preserved sample size but yielded a less straightforward and precise interpretation of the results.

6. Policy Implications

To achieve both micro (i.e., according to the literature on human capital accumulation of Mincer (1974)) and macro-level (i.e., according to the endogenous growth theory of Romer (1990)) growth and limit migration, the national government could raise school presence and quality, expand the teaching staff and improve infrastructures to facilitate children's commute to school. The focus on developing Moroccan infrastructures is mainly driven by the empirical finding that the distance from school (and the personal security issues connected with it) suggests that opportunity costs hinder school attendance more than pecuniary ones do. According to Glick (2008), this policy measure is particularly important given the common finding that female enrolment reacts much more to a change in variables denoting school distance or availability, compared to male.

A combined effort has to be exerted in bundling togheter educational and labour market reforms. The latter should aim to create a dynamic labour market which will facilitate literate youngsters to find a satisfactory job soon after leaving the educational system. Minimizing the time the educated youth will spend in unemployment will improve the chances that, once they will have become parents or household heads, they will promote dependants' participation in schooling. Their experience will be the best example of the benefits of education. National policies devoted to providing child care facilities should be taken into consideration to reduce the extent of gender bias against female schoolchildren given their likely involvement in childminding within the household.

The recommendation for a monetary transfer devoted to relax the household budget constraint and facilitate the allocation of resources to education should be formulated after an analysis of schooling participation which exceeds the consideration of the sole luxury axiom. A thorough analysis of the causes of child labour and of the actual allocation of the funds could determine whether disbursing monetary or in-kind transfers to families with children in schooling age maximizes the number of those who will enrol. If child labour is employed to generate resource devoted to hedonistic consumption enjoyed by the adults in the household, then a restriction or ban on child labour may be conducive to a better children's development. Therefore, conditions for receiving school subsidies have to be attentively devised to limit the extent of both under coverage and leakage. The estimates for Morocco respect the established literature that a female adult is the most appropriate household member to manage the transfers to ensure that the focus on education is maintained.

The Moroccan evidence supports gender bias against females since their school attendance possibilities are fewer while their probability of being child labourers increases. Changes in adult's attitude toward young girls in the household and their human capital accumulation opportunities are likely to provide better results in curbing gender bias against females than relying on economic incentives only. This is likely to imply a radical cultural change in a deeply masculine society and a more egalitarian bearing, across the two genders, of favourable and unfavourable household-level shocks. Exceptional care has to be devoted to the selection of suitable means of monitoring the progresses of these reforms. For instance, the age of the household head – used in the Moroccan model as a proxy for the adult's attitude towards pupils' allocation of time – does not seem appropriate since it displayed a negative correlation to both schooling and working participation.

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Appendix A

Issues concerning the covariates of the parsimonious pooled-model for education

Instrumentation of the natural logarithm of the per capita expenditure

Greene (2008) warns that having an endogenous right hand side variable when estimating a binary choice model is a more serious problem than when using *OLS*. This happens because the *IV* procedure is centred on the moments of the data, embedded into the least square estimation procedure, while binary models usually employ *maximum likelihood estimation (MLE)*. The *generalized method of moments (GMM)* might be preferable to the *IV* but, in both cases, "nothing is gained in simplicity or robustness of this approach to *full information maximum likelihood estimation [FIML]*[39]" (Greene, 2008:20).

Attempting the *IV* estimation, the procedure required an appropriate set of instruments granting relevance and over-identification. Suitable variables were looked for among those for durable goods belonging to the household and dummies for sanitation facilities in the accommodation. The instruments, which achieved relevance[40] and exogeneity[41], were the dummies for the presence of toilet and bath, the number of dishwashers and personal computers. At the end of the procedure, the test for the exogeneity of the log of the per capita expenditure is insignificant at conventional levels. Therefore, the need for instrumentation is statistically rejected.

[39] Because of the absence of a procedure for both FIML and LIML (limited information maximum likelihood) in STATA 9.2, the IV estimation relies on a two-step procedure.
[40] This test F(4, 431) = 20.55 was significant a 1% confidence level.
[41] The over-identification Sargan test $\chi^2(3) = 5.704$ was not significant at conventional levels granting instrument exogeneity.

About the separability of individual decisions in a household

According to Bowlus and Sicular (2003) a simple *t* test on the significance of explanatory variables which affect only one of multiple joint decisions is sufficient. Identifying these covariates confidently is always challenging since it might be difficult to establish a theoretical and testable independence. For example, Bowlus and Sicular (2003) argue that household size and composition should affect household consumption demand but not the amount of labour it requires to work its farm. Notwithstanding the popularity of this approach,[42] it might be argued that both characteristics impact on both consumption and working choices. Nonetheless, it is possible that the empirical test drives the theoretical conclusion.

Heteroscedasticity in a probit model with survey data

In STATA, it is not possible to test for heteroscedasticity after having estimated a probit model. Nevertheless, the latter suffers inherently from this problem (Reilly, 2007). Beside this theoretical aspect, Dancer and Rammohan (2006) point out that:

> "In using cross-section data […] households within the cluster may have similar characteristics, and ignoring these cluster fixed effects is likely to give us biased estimates. If these similarities are not specified in the model […] the intra-cluster correlations lead to heteroscedasticity, which will bias the estimated standard errors." (Dancer and Rammohan, 2006:6)

One solution to this econometric problem would be to include community level covariates that denote characteristics common to groups of households. Unfortunately, employing such variables here is impossible since the relevant questionnaire is available for the rural (Douar) communities only. Therefore, the STATA correction for cluster fixed effects was implemented using the *PSU*[43] identifier as the cluster variable.

Estimation issues for the models on education

The schooling equation in model (5) suffered from collinearity between the dummies for father/mother of the household head and father/mother in law. Likewise, the dummies for the head of the household holding the "diplomes de technicien" and the

[42] Bowlus and Sicular (2003) develop the Benjamin (1992) model using panel data estimation techniques.

[43] PSU denotes the variable taken into account as reference when preparing a representative sample.

"diplomes professionnelle" were perfect classifiers of the favourable case. They were dropped in order to maximise the number of observations used in estimation.

The fully interacted model suffered from perfect predictors in excess of those affecting the pooled one. In the first place, the interacted covariates for the Laayoune-Boujdour-Sakia El Hamra region, the household head with Secondaire and Technicien Superieur diploma required exclusion. The latter variable was itself a perfect classifier of the absence from school. Moreover, the dummy for being a son/daughter-in-law of the household head was collinear to other covariates. All of them were dropped. Despite this refinement, 62 successes completely determined were a source of additional concern. This problem was eased estimating the model on observations yielding less than unitary predicted probability[44]. Consequently, the interacted dummy for living in the Guelmime Es-Sema region was collinear and was amended from the final model. This specification was the basis for evaluating the joint statistical significance of the interaction terms.

The male model reported problems very similar to those arising for the fully interacted one while the female added the dummy of the household head holding a Technical-Superieur diploma to the set of perfect predictors.

Estimation issues for the working status models

The working status equation in model (5) suffered from the dummies for the household head having a technical diploma and professional qualification, him/her being unemployed and divorced; the condition of being a son/daughter-in-law of the household head being all perfect predictors of the individual's inactive condition. Once these covariates were dropped from the model, 30 failures were still completely determined. A procedure similar to the one above was employed. Correcting the existing problems and estimating the model on the same sample for the educational one, the dummy for living in the Taza-Al Hoceima-Taounate region was excluded due to collinearity.

The fully interacted version of the model for working condition is, once again, affected by perfect prediction and collinearity problems involving the interacted dummy for living in Laayoune-Boujdour-Sakia El Hamra; for the household head holding a diploma Secondaire, diploma de Faculte Superieur and Technicien

[44] This customized procedure is incidentally equivalent to a more elegant, but cumbersome, official one (STATA Corp., 2005)

Superieur. The dichotomous variable for diploma Technicien Superieur was itself a perfect predictor of working. All the problematic variables were dropped.

Estimating the model on the male sub–sample, the perfect prediction problem affected the following variables: the dummy for Laayoune-Boujdour-Sakia El Hamra; the household head's diploma Secondaire, diploma Superieur and of Technicien Superieur. All of them were dropped. In the female case, the only indeterminate variable is the household head with the technical superior diploma.

Appendix B (tables)

Table 1 Summary of the expected effects of the RHS variables on the probabilities

Variables	Effect on the probability of going to school	Effect on the probability of going to work
Age	(0): no clear expectation on the combined *ME* but a concave parabola is expected (Dancer and Rammohan, 2006; Ray, 2000; Drèze and Kingdon, 2001)	(0): even less clear expectation due to the very fragmented nature of child labour. Probably, absence of non linear relationships.
Dummy for gender	(+): relying on the "usual" direction of the gender bias	(-): the "usual" direction of bias will preserve men from working
Dummy for urban	(+): due to higher concentration of educational facilities	(0): due to failing to account for the sector of employment
Regional dummies	(0): no expectations	(0): no expectations
Poverty dummy	(-): luxury hypothesis (Basu and Van, 1998)	(+): luxury hypothesis (Basu and Van, 1998)
BMI	(+): due to the contribution of a well nourished body to attentiveness etc. (Ayalew, 2000)	(+): due to the need of physical energies to complete demanding tasks (Ayalew, 2000)
Expenditure measure	(+): luxury hypothesis on education (Basu and Van, 1998)	(-): luxury hypothesis on education (Basu and Van, 1998)
Relationship with the household head dummies	(+):the closer is the tie, the higher is the probabilistic effect	(-):the shorter is the relationship the stronger is the *IE*.
Proportion of female pupils	(0): it is possible to make tentative expectations in the gender-specific models only (Dancer and Rammohan, 2006)	(0): it is possible to make tentative expectations in the gender-specific models only (Dancer and Rammohan, 2006)
Female household head	(+): a female head values pupils' human capital accumulation more than a male (Unni, 1998; Jayachandran, 1997)	(-): a female household head induces a stronger substitution effect (schooling for labour time) than a male head (Unni, 1998; Jayachandran, 1997)
Household size	(0): the possible lack of resources on a per capita terms would yield (Walters and Briggs, 1993) (-) but the presence of more people available for child minding will free up school-age children (+)	(0): larger households require far higher resources (Walters and Briggs, 1993) (+) but the large number of "employable" people in the household will free pupils' time enough to yield (-)
Household head's diploma	(+): a more literate head will try to perpetuate his/her condition in the next generation too. Moreover, the higher the qualification the larger the effect on probability (among others Drèze and Kingdon, 2001 and Francavilla and Lyon, 2002)	(-): a literate head will value education a lot, hence will try to move his/her children out of the field and into the class (among others Drèze and Kingdon, 2001 and Francavilla and Lyon, 2002)

Table 1 Summary of the expected effects of the RHS variables on the probabilities *(continued)*

Variables	Effect on the probability of going to school	Effect on the probability of going to work
Occupational status of the head	(+): substitution hypothesis based on the violation of the separability test (Basu and Van, 1998)	(-): substitution hypothesis based on the violation of the separability test (Basu and Van, 1998)
Marital status of the head	(+): living with a married head provides a better environment for human capital accumulation (Francesconi *et al*, 2005)	(-): living with an additional adult, likely to work, might induce a substitution effect for the children's time (Basu and Van, 1998)
Age of the head	(-): assuming that age is inversely related to the positive perception of education (Ashton, 1945). It is possible that benevolence inverts the sign (+)	(+): an old head is likely to have experienced child labour him/herself (Ashton, 1945). Benevolence might reverse the direction of the effect (-)
Distance from school	(-): according to the opportunity cost of schooling argument	(+): this sign might be particularly appropriate when considering "local" jobs: housekeeping, child minding, herding and other tasks on the household farm
Expenditure for schooling	(-): according to the opportunity cost argument (World Bank, 2001b:47)	(+): besides the standard argument for the opportunity cost (World Bank, 2001b:47), it is even stronger when a wage job is taken into account
Wealth variables	(+): standard substitution effect but Cockburn (2000) warns that according to the type of assets the effects vary quite dramatically and yield, on aggregate, (0)	(-): standard substitution effect but it is possible that the net effect of several Cockburn (2000) assets is (0)

Source: author's compilation on cited literature

Table 2 Descriptive statistics for the education models

Variable	Definition	Education Model			Working Model		
		Pooled model	Female Model	Male Model	Pooled model	Female Model	Male Model
P_s	=1 if the pupil goes to school, 0 otherwise	0.7753 N/A	N/A	N/A	N/A	N/A	N/A
P_s^F	=1 if the female pupil goes to school, 0 otherwise	N/A	0.6924 N/A	N/A	N/A	N/A	N/A
P_s^M	=1 if the male pupil goes to school, 0 otherwise	N/A	N/A	0.8530 N/A	N/A	N/A	N/A
P_w	=1 if the pupils is working, 0 otherwise	N/A	N/A	N/A	0.1049 N/A	N/A	N/A
P_w^F	=1 if the female pupil is working, 0 otherwise	N/A	N/A	N/A	N/A	0.1297 N/A	N/A
P_w^M	=1 if the male pupil is working, 0 otherwise	N/A	N/A	N/A	N/A	N/A	0.0804 N/A
Age	Age of the pupil in years	10.7809 (2.5123)	10.8531 (2.5528)	10.7121 (2.4708)	10.7825 (2.5132)	10.8539 (2.5550)	10.7122 (2.4698)
Age squared	Age of the pupil in years squared	122.5384 (55.0516)	124.3047 (55.9843)	120.8517 (54.0890)	122.5768 (55.0744)	124.3317 (56.0294)	120.8488 (54.0733)
Male	=1 if the child is male, 0 otherwise	0.5041 N/A	N/A	N/A	0.5039 (0.5000)	N/A	N/A
Urban	=1 if the child is living in an urban area, 0 otherwise	0.5348 N/A	0.5281 N/A	0.5294 N/A	0.5303 (0.4991)	0.5238 (0.4995)	0.5368 (0.4987)
Oued Ed-Dahab–Lagouira	=1 if the child lives in the Oued Ed-Dahab–Lagouira region, 0 otherwise. Base category	0.0089 N/A	0.0085 N/A	0 N/A	N/A	N/A	N/A
Laayoune-Boujdour-Sakia El Hamra	=1 if the child lives in the Laayoune-Boujdour-Sakia El Hamra region, 0 otherwise	0.0153 N/A	0.0142 N/A	0 N/A	0.0155 N/A	0.0144 N/A	0.0166 N/A
Guelmime Es-Sema	=1 if the child lives in the Guelmime Es-Sema region, 0 otherwise	0.0339 N/A	0.0317 N/A	0.0370 N/A	0.0342 N/A	0.0320 N/A	0.0364 N/A
Souss-Massa-Daraa	=1 if the child lives in the Souss-Massa-Daraa region, 0 otherwise	0.0970 N/A	0.0980 N/A	0.0986 N/A	0.0980 N/A	0.0989 N/A	0.0970 N/A
Gharb-Chrarda-Beni Hssen	=1 if the child lives in the Gharb-Chrarda-Beni Hssen region, 0 otherwise	0.0720 N/A	0.0712 N/A	0.0747 N/A	0.0727 N/A	0.0718 N/A	0.0736 N/A
Chaouia-Ouardigha	=1 if the child lives in the Chaouia-Ouardigha region, 0 otherwise	0.0525 N/A	0.0488 N/A	0.0575 N/A	0.0530 N/A	0.0493 N/A	0.0566 N/A
Tensift Al Haouz	=1 if the child lives in the Tensift Al Haouz region, 0 otherwise	0.1009 N/A	0.1074 N/A	0.0969 N/A	0.1018 N/A	0.1084 N/A	0.0954 N/A

Table 2 Descriptive statistics for the education models *(continued)*

Variable	Definition	Education Model			Working Model		
		Pooled model	Female Model	Male Model	Pooled model	Female Model	Male Model
Oriental	=1 if the child lives in the Oriental region, 0 otherwise	0.0565 N/A	0.0606 N/A	0.0538 N/A	0.0568 N/A	0.0612 N/A	0.0525 N/A
G.Casablanca	=1 if the child lives in the G.Casablanca region, 0 otherwise	0.1017 N/A	0.1009 N/A	0.1051 N/A	0.1024 N/A	0.1014 N/A	0.1035 N/A
Rabat-Salé-Zemmour-Zaer	=1 if the child lives in the Rabat-Salé-Zemmour-Zaer region, 0 otherwise	0.0694 N/A	0.0627 N/A	0.0780 N/A	0.0701 N/A	0.0632 N/A	0.0768 N/A
Doukala Abda	=1 if the child lives in the Doukala Abda region, 0 otherwise	0.0664 N/A	0.0651 N/A	0.0694 N/A	0.0670 N/A	0.0657 N/A	0.0683 N/A
Tadla Azilal	=1 if the child lives in the Tadla Azilal region, 0 otherwise	0.0537 N/A	0.0533 N/A	0.0554 N/A	0.0542 N/A	0.0538 N/A	0.0546 N/A
Meknes Tafil	=1 if the child lives in the Meknes Tafil region, 0 otherwise	0.0637 N/A	0.0627 N/A	0.0665 N/A	0.0644 N/A	0.0632 N/A	0.0655 N/A
Fes-Boulemane	=1 if the child lives in the Fes-Boulemane region, 0 otherwise	0.0520 N/A	0.0541 N/A	0.0513 N/A	0.0525 N/A	0.0546 N/A	0.0505 N/A
Taza-Al Hoceima-Taounate	=1 if the child lives in the Taza-Al Hoceima-Taounate region, 0 otherwise	0.0664 N/A	0.0740 N/A	0.0604 N/A	0.0670 N/A	0.0747 N/A	0.0594 N/A
Tanger-Tetouan	=1 if the child lives in the Tanger-Tetouan region, 0 otherwise	0.0898 N/A	0.0867 N/A	0.0953 N/A	0.0904 N/A	0.0874 N/A	0.0934 N/A
Indigence	=1 if the children is poor according to the poverty line form the World Bank, 0 otherwise	0.2080 N/A	0.2136 N/A	0.2078 N/A	0.2098 N/A	0.2151 N/A	0.2045 N/A
Body mass index	Children's BMI	17.2568 (3.3502)	17.4397 (3.2026)	17.0733 (3.4847)	17.2579 (3.3443)	17.4311 (3.1863)	17.0873 (3.4851)
No relationship with the H.H.[45]	=1 if the child has no relationship with the household head, 0 otherwise	0.0079 N/A	0.0134 N/A	0.0025 N/A	0.0079 N/A	0.0135 N/A	0.0024 N/A
Sibling of the H.H.	=1 if the child is the sibling of the household head, 0 otherwise	0.0129 N/A	0.0146 N/A	0.0115 N/A	0.0130 N/A	0.0148 N/A	0.0113 N/A
Grandchild of the H.H.	=1 if the child is the grandchild of the household head, 0 otherwise	0.0801 N/A	0.0797 N/A	0.0813 N/A	0.0804 N/A	0.0800 N/A	0.0808 N/A
Sons of the H.H.[46]	=1 if the child is the son of the household head, 0 otherwise	0.8691 N/A	0.8605 N/A	0.8760 N/A	0.8686 N/A	0.8600 N/A	0.8771 N/A
Son-in-law of the H.H.	=1 if the child is the son-in- law of the household head, 0 otherwise	0.0006 N/A	0.0012 N/A	0 N/A	0.0006 N/A	0.0012 N/A	0 N/A

[45] This category comprises those without a link to the household head and those who were working for the household.
[46] This category comprises pupils born in the household and adopted.

Table 2 Descriptive statistics for the education models *(continued)*

		Education Model			Working Model		
Variable	**Definition**	**Pooled model**	**Female Model**	**Variable**	**Definition**	**Pooled model**	**Female Model**
Other relationships with the H.H.	=1 if the child has other relationships with the household head, 0 otherwise	0.0295 N/A	0.0305 N/A	0.0287 N/A	0.0293 N/A	0.0304 N/A	0.0283 N/A
Proportion of female children	Proportion of female children in schooling age out of the household size	0.3665 (0.2860)	0.5424 (0.2480)	0.1939 (0.2035)	0.3669 (0.2861)	0.5428 (0.2479)	0.1937 (0.2037)
Female household head	=1 if the household head is female, 0 otherwise	0.1158 N/A	0.1131 N/A	0.1162 N/A	0.1143 N/A	0.1125 N/A	0.1160 N/A
Family size	Number of people in the household	8.7503 (3.0461)	7.8832 (3.1303)	7.6267 (2.9743)	8.7466 (3.0468)	8.8752 (3.1295)	8.6200 (2.9582)
No Diploma	=1 if the household head has no diploma, 0 otherwise. Base category	0.8303 N/A	0.8360 N/A	0.8279 N/A	0.8303 N/A	0.8366 N/A	0.8242 N/A
Diploma Fondamental	=1 if the household head has the diploma Fondamental, 0 otherwise	0.1283 N/A	0.1225 N/A	0.1322 N/A	0.1281 N/A	0.1215 N/A	0.1346 N/A
Diploma Secondaire	=1 if the household head has the diploma Secondaire, 0 otherwise	0.0202 N/A	0.0216 N/A	0.0181 N/A	0.0202 N/A	0.0218 N/A	0.0186 N/A
Diploma Superieur	=1 if the household head has the diploma Superieur, 0 otherwise	0.0157 N/A	0.0151 N/A	0.0156 N/A	0.0159 N/A	0.0152 N/A	0.0166 N/A
Diploma Technicien Superieur	=1 if the household head has the diploma Technicien Superieur, 0 otherwise	0.0008 N/A	0.0004 N/A	0.0012 N/A	0.0008 N/A	0.0004 N/A	0.0012 N/A
Diploma de Technicien	=1 if the household head has the diploma de Technicien, 0 otherwise	0.0044 N/A	0.0041 N/A	0.0049 N/A	0.0045 N/A	0.0041 N/A	0.0049 N/A
Diploma Professionelle	=1 if the household head has the diploma Professionelle, 0 otherwise	0.0002 N/A	0.0004 N/A	0 N/A	0.0002 N/A	0.0004 N/A	0 N/A
Inactive	=1 if the household head is inactive, 0 otherwise. Base category	0.1840 N/A	0.1855 N/A	0.1836 N/A	0.1839 N/A	0.1851 N/A	0.1827 N/A
Unemployed	=1 if the household head is unemployed, 0 otherwise	0.0226 N/A	0.0183 N/A	0.0263 N/A	0.0218 N/A	0.0181 N/A	0.0255 N/A
Employed	=1 if the household head is employed, 0 otherwise	0.7934 N/A	0.7962 N/A	0.7901 N/A	0.7943 N/A	0.7968 N/A	0.7918 N/A
Single	=1 if the household head is single, 0 otherwise. Base category	0.0105 N/A	0.0134 N/A	0.0078 N/A	0.0106 N/A	0.0135 N/A	0.0077 N/A
Married	=1 if the household head is married, 0 otherwise	0.9250 N/A	0.9219 N/A	0.9310 N/A	0.9269 N/A	0.9228 N/A	0.9309 N/A
Divorced	=1 if the household head is single, 0 otherwise	0.0069 N/A	0.0049 N/A	0.0074 N/A	0.0061 N/A	0.0049 N/A	0.0073 N/A

Table 2 Descriptive statistics for the education models *(continued)*

		Education Model			Working Model		
Variable	**Definition**	**Pooled model**	**Female Model**	**Variable**	**Definition**	**Pooled model**	**Female Model**
Widow/Widower	=1 if the household head is a widow or a widower, 0 otherwise	0.0577 N/A	0.0598 N/A	0.0538 N/A	0.0564 N/A	0.0587 N/A	0.0542 N/A
Age of the Household Head	Age of the household head in years	47.8759 (11.1738)	47.9361 (11.1863)	47.8628 (11.2071)	47.8456 (11.1636)	47.8682 (11.1488)	47.8234 (11.1805)
Time to go to school	Provincial average time to school in minutes	17.6024 (4.6805)	17.7683 (4.7983)	17.6538 (4.4150)	17.6680 (4.6514)	17.8336 (4.7693)	17.5049 (4.5274)
Education expenditure	Natural logarithm of the provincial average total educational expenditure	6.0169 (0.3972)	6.0162 (0.4029)	6.0060 (0.3897)	6.0123 (0.3960)	6.0116 (0.4017)	6.0130 (0.3904)
Square metres	Squares metres the household lives on	3.2455 (1.5497)	3.2705 (1.5350)	3.2193 (1.5762)	3.2473 (1.5543)	3.2713 (1.5398)	3.2235 (1.5684)
Other ownership rights	=1 if the household lives in a dwelling with other arrangements, 0 otherwise. Base category	0.0484 N/A	0.0480 N/A	0.0485 N/A	0.0487 N/A	0.0480 N/A	0.0493 N/A
Owned house	=1 if the household lives in an owned dwelling, 0 otherwise.	0.7260 N/A	0.7457 N/A	0.7170 N/A	0.7318 N/A	0.7512 N/A	0.7126 N/A
Rented house	=1 if the household lives in a rented dwelling, 0 otherwise.	0.1442 N/A	0.1277 N/A	0.1573 N/A	0.1440 N/A	0.1281 N/A	0.1597 N/A
Free house	=1 if the household lives in a dwelling occupied for free, 0 otherwise.	0.0813 N/A	0.0785 N/A	0.0772 N/A	0.0756 N/A	0.0727 N/A	0.0784 N/A
Expenditure	Natural logarithm of per capita yearly household expenditure	8.6457 (0.6704)	8.6428 (0.6731)	8.6269 (0.6591)	8.6373 (0.6663)	8.6339 (0.6681)	8.6405 (0.6646)
Obs.		4,957	2,458	2,435	4,910	2,436	2,474

Source: author's compilation on *ENNVM* 1998/1999 data

Table 3 Pooled-model for school attendance of pupils

Variable	Probit coefficients	*ME/IE*
Age	0.61779***[47]	0.1211
Age squared	-0.0324***	-0.0063
Gender	0.7022***	0.1392#
Urban	1.3259***	0.2792#
Indigence	-0.2644***	-0.0567#
Body mass index	-0.0326***	-0.0064
Sibling of the household head	2.4052***	0.1226#
Grandchild of the household head	3.4277***	0.1793#
Child of the household head	3.1562***	0.8853#
Son/daughter-in-law of the household head	2.1479***	0.1164#
Other relationships with the household head	2.8936***	0.1341#
Female household head	0.2724*	0.0470#
Household Head with Diploma Fondamental	0.6362***	0.0930#
Household Head with Diploma Secondaire	0.6998***	0.0892#
Age of the Household Head	-0.0067*	-0.0013
Provincial average total minutes to go to school	-0.0300**	-0.0059
Square metres	0.1083***	0.0212
Ln of per capita yearly expenditure	0.1935**	0.0379
$\widehat{y_i}$		0.8834
Number of observations		4,957
Joint Significance		Wald χ^2 (46) = 695.37***
Pseudo R^2		0.3558
***Log* pseudo likelihood**		-1701.4633

Source: author's estimation on *ENNVM* 1998/1999 data **Note:** ***, **, * denote variables significant at 1%,5% and 10% respectively; # denotes an *IE*

Table 4 Maxima in the probabilities of schooling on aggregate and in gender-specific models

Country	Maximum at			Ages span
	Overall	Male	Female	
Morocco	9.53	10.39	8.46	7 – 15
Nepal	10.05	10.87	9.15	6 – 17
India	11.34	11.58	11.34	6 – 14
Peru	8.34	-	-	6 – 17
Pakistan[48]	9.22	-	-	10 – 17

Source: author's calculation on displayed estimates, Dancer and Rammohan (2006), Drèze and Kingdon (2001) and Ray (2000)

[47] Statistical significance based on robust standard errors originating from 432 clusters in *PSU*.
[48] This is the first instance, of many more, of a maximum falling outside the age range considered in estimation. According to Monge Zegarra (private conversation) this event does not denote any major mistake.

Table 5 Single gender models for educational attendance and *ME/IE*

Variable	Male probit	Male *ME/IE*	Female probit	Female *ME/IE*
Age	0.8996***[49]	0.1131	0.4349***[50]	0.1223
Age squared	-.04329***	-0.0054	-0.0257***	-0.0072
Urban	1.1340***	0.1590#	1.4654***	0.4117#
Gharb-Chrarda-Beni Hssen	-0.6359*	-0.1173#	0.0229	0.0064#
Tensift El Haouz	-0.6854*	-0.1275#	0.1421	0.0381#
Fes-Boulemane	-0.7787**	-0.1580#	-0.1598	-0.0476#
Tanger-Tetouan	-1.1375***	-0.2601#	-0.1077	-0.0314#
Indigence	-0.1493	-0.0201#	-0.3555***	-0.1080#
Body mass index	-0.0239**	-0.0030	-0.0409***	-0.0115
Sibling of the household head	1.1616*	0.0622#	3.0360***	0.2140#
Grandchild of the household head	2.3656***	0.0921#	3.8188***	0.2973#
Child of the household head	2.2499***	0.6381#	3.4463***	0.8895#
Daughter-in-law of the H.H.	N/A	N/A	2.8008***	0.2022#
Other relationships with the H.H.	2.0436***	0.0718#	3.0561***	0.2285#
Female household head	0.3289	0.0341#	0.3528*	0.0876#
Household size	-0.0030	-0.0004	-0.0344*	-0.0097
H.H. with Diploma Fondamental	0.4006**	0.0403#	0.7970***	0.1677#
H.H. with Diploma Secondaire	N/A	N/A	0.6259*	0.1315#
Age of the Household Head	-0.0102**	-0.0013	-0.0028	-0.0008
Prov. average total minutes to school	-0.0266	-0.0033	-0.0355**	-0.0100
Square metres	0.0740**	0.0093	0.1332***	0.0374
Ln of per capita yearly expenditure	0.3769***	0.0474	0.0950	0.0267
$\widehat{y_i}$		0.9357		0.7986
Number of observations		2,435		2,458
Joint Significance		Wald χ^2 (40) = 291.81***		Wald χ^2(44) = 559.90***
Pseudo R^2		0.3115		0.3726
***Log* pseudo likelihood**		-699.9158		-951.7132

Source: author's estimation on *ENNVM* 1998/1999 data **Note:** ***, **, * denote variables significant at 1%,5% and 10% respectively; # denotes an *IE*

Table 6 "Conversion" table to be used with Figure 1

Region Number	Region Name
1	Chaouia-Ouardigha
2	Doukala-Abda
3	Fès-Boulemane
4	Gharb-Chrarda-Béni Hsen
5	Grand Casablanca
6	Guelmim-Es Semara
7	Laâyoune-Boujdour
8	Marrakesch-Tensift-El Haouz
9	Meknès-Tafilalet
10	Oriental
11	Oued ed Dahab-Lagouira
12	Rabat-Salé-Zemmour-Zaer
13	Souss-Massa-Daraâ
14	Tadla-Azilal

[49]Statistical significance based on robust standard errors originating from 414 clusters in *PSU*.
[50]Statistical significance based on robust standard errors originating from 423 clusters in *PSU*.

15	Tanger-Tétouan
16	Taza-Al Hoceïma-Taounate

Source: Wikipedia (2008)

Table 7 Probit model for the children being employed

Variable	Probit	*ME/IE*
Age	0.2449**[51]	0.0143
Gender	-0.2155***	-0.0126#
Urban	-1.7367***	-0.1463#
Souss-Massa-Daraa	-0.5521*	-0.0213#
Oriental	-1.3102***	-0.0289#
Rabat-Salé-Zemmour-Zaer	-0.4559*	-0.0183#
Doukala Abda	-0.4891*	-0.0191#
Meknes Tafil	-0.9967***	-0.0270#
Indigence	0.2335**	0.0156#
Body mass index	0.0358***	0.0021
Sibling of the household head	-2.9017***	-0.0272#
Grandchild of the household head	-2.8671***	-0.0417#
Child of the household head	-2.9390***	-0.7134#
Other relationships with the household head	-2.9295***	-0.0304#
Household size	0.0294*	0.0017
Household Head with Diploma Fondamental	-0.4632***	-0.0196#
Household Head with Diploma Secondaire	-0.5063*	-0.0185#
Household Head with Diploma Superieur	-0.5839**	-0.0199#
Household Head employed	0.3539***	0.0170#
Age of the Household Head	-0.0046*	-0.0003
Provincial average total minutes to go to school	0.0075**	0.0004
Square metres	-0.0641*	-0.0037
Owned house	0.7268***	0.0323#
Rented house	0.6431**	0.0591#
Free house	0.5868*	0.0555#
Ln of per capita yearly expenditure	0.2596**	0.0151
$\hat{y}_i$		0.0249
Number of observations		4,910
Joint Significance		Wald χ^2 (42) =487.63***
Pseudo R^2		0.3482
Log pseudo likelihood		-1074.2983

Source: author's estimation on *ENNVM* 1998/1999 data **Note:** ***, **, * denote variables significant at 1%,5% and 10% respectively; # denotes an *IE*

[51] Statistical significance based on robust standard errors originating from 427 clusters in *PSU*.

Table 8 Gender-specific models for working condition

Variable	Male Probit	Male *ME/IE*	Female Probit	Female *ME/IE*
Age	0.0144[52]	0.0006	0.4668***[53]	0.0288
Age squared	0.0057	0.0002	-0.0133*	-0.0008
Urban	-1.4637***	-0.0843#	-2.0370***	-0.1917#
Guelmime Es-Sema	-0.4213	-0.0112#	-0.8111*	-0.0250#
Souss-Massa-Daraa	-0.4587	-0.0125#	-0.6580*	-0.0252#
Oriental	-1.1301**	-0.0178#	-1.5848***	-0.0329#
Doukala Abda	-0.2175	-0.0071#	-0.7402*	-0.0255#
Meknes Tafil	-0.6875	-0.0151#	-1.1840***	-0.0305#
Fes-Boulemane	0.7357**	0.0593#	-0.1502	-0.0081#
Poor	0.2687*	0.0128#	0.2067	0.0143#
Body mass index	0.0445***	0.0018	0.0249	0.0015
Sibling of the household head	-2.0978***	-0.0169#	3.2707***	-0.0298#
Grandchild of the household head	-2.6960***	-0.0269#	-2.9186***	-0.0447#
Sons of the household head	-2.6026***	-0.5472#	-3.1124***	-0.7628#
Other relationships with the household head	-2.4086***	-0.0188#	-3.2340***	-0.0334#
Prop. of female children in schooling age	-0.1573**	-0.0063	0.0020	0.0001#
Female household head	-1.2519***	-0.0221#	0.1074	0.0072#
Family size	0.0378*	0.0015	0.0298	0.0018
Household Head with Diploma Fondamental	-0.5793***	-0.0152#	-0.3489*	-0.0169#
Household Head with Diploma Secondaire	N/A	N/A	-0.2175**	-0.0110#
Household Head employed	0.4709***	0.0144#	0.3546**	0.0181#
Household Head married	0.4720*	0.0124#	0.0131	0.0008#
Household Head widow	1.9815***	0.3804#	-0.3471	-0.0160#
Prov. average total minutes to school	0.0307*	0.0012	-0.0062	-0.0004
Square metres	-0.1048**	-0.0042	-0.0510	-0.0031
Owned house	0.6818**	0.0213#	0.7947***	0.0357#
Free house	0.5949**	0.0408#	0.5979	0.0601#
Ln. of per capita yearly expenditure	0.1368	0.0054	0.3444***	0.0213
$\widehat{y_i}$		0.0159		0.0267
Number of observations		2,474		2,436
Joint Significance		Wald $\chi^2(37) = 274.19$***		Wald $\chi^2(40) = 330.70$***
Pseudo R^2		0.3386		0.3766
***Log* Pseudo Likelihood**		-457.8721		-585.9348

Source: author's estimation on *ENNVM* 1998/1999 data **Note:** ***, **, * denote variables significant at 1%,5% and 10% respectively; # denotes an *IE*

[52] Statistical significance based on robust standard errors in 420 *PSUs*.
[53] Statistical significance based on robust standard errors in 419 *PSUs*.