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"CHILDREN'S WORKING HOURS AND SCHOOL ENROLMENT: EVIDENCE FROM PAKISTAN AND NICARAGUA"

FURIO CAMILLO ROSATI AND MARIACRISTINA ROSSI

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Children's working hours and school enrolment:

Evidence from Pakistan and Nicaragua

Furio Camillo Rosati[*+]

Mariacristina Rossi[*#]

Abstract

We analyse the determinants of school attendance and hours worked by children in Pakistan and Nicaragua. On the basis of a theoretical model of children's labour supply, we simultaneously estimate the school attendance decision and the hours worked by Full Model Maximum Likelihood. We analyse the marginal effects of explanatory variables conditioning on the "latent" status of children in terms of schooling and work. We show that these effects are rather different, and discuss the policy implication of this finding.

Key words: child labour, education, human capital

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[+] UCW, project co-ordinator and University of Rome, "Tor Vergata", Italy. Contact: frosati@ucw-project.org

[#] UCW, researcher and University of Rome, "Tor Vergata", Italy. Contact: rossi@economia.uniroma2.it.

1. Introduction

Child labour is thought to be harmful in many ways to children's welfare. It interferes with human capital accumulation and may affect the present and future health of the child. The determinants of child labour supply have been recently analysed in the literature (see Basu (1999), Rosati- Tzannatos (2003), Cigno- Rosati- Tzannatos (2001), Cigno – Rosati (2002), and the literature therein cited for the discussion of theoretical models and empirical results). The attention of the literature has mainly focused on the determinants of the categorical decision of the household on the activity of the child: whether to send a child to school, to work or allow him to perform both activities[1]. Almost no attention has been paid to the amount of time that children devote to work (either when this is their only activity or when they combine it with school attendance). An exception is Ray (2000), which, however, treats labour supply separately from the household decision of sending a child to school.

The number of hours spent working is not only important in itself as a measure of child welfare (it is a measure of forgone leisure, etc.), but is also an essential ingredient to evaluate the cost of work in terms of health and human capital accumulation.

In this paper we analyse the hours of work supplied by children. As mentioned above, the literature on child labour has mainly focused on the participation decision of the children. Almost no attention has been paid to the hours supplied. This paper innovates on the existing literature by focusing on the simultaneous decision relative to school attendance and to the amount of work supplied. On the basis of a simple theoretical model, we estimate a simultaneous two equations system. This model allows us not only us to take into proper consideration the joint decisions about work and schooling, but also to calculate marginal effects conditioning on the "latent" propensity of the child to attend school and/or to work. These marginal effects are in some cases rather different across the "latent" states of the child and this has interesting analytical and policy implication.

[1] For the quantitatively non negligible cases in which children appears to neither work nor go to school se the literature cited.

2. A theoretical outline

To outline our theoretical model we consider an altruistic set up, where parents care about the present and future consumption and current leisure of their children [2]. The number of children is taken as given and for simplicity of exposition is normalized to 1[3]. We also assume that human capital accumulation is the only way to transfer resources for children's future consumption[4]. Human capital is accumulated by sending children to school[5]. The time a child has to spend at school is fixed at h_S. Normally school hours are not flexible and school attendance requires a minimum fixed amount of time devoted to school. Some of the children that work and attend school might miss classes and thus make their school hours more "flexible". However, the degree of "flexibility" that can be achieved in this way is rather limited, as skipping school often results in dropping out and is normally not tolerated by school authorities[6]. Hence we treat school hours as fixed. School attendance does not rule out child labour. However, we assume that working hours have a negative influence on human capital accumulation. Hours spent at work reduce time available for study, tire the child and reduce her learning productivity, etc. Given the nature of the work that children perform, mainly unskilled and mostly at their family farm or business, we can safely consider the hours spent at work, $h_{L,}$ as flexible and treat them as a continuous choice variable.

The human capital production function takes the form:

$$H=h\ (h_L;\ h_S);\ \ h(\ ,0)=0 \qquad (1)$$

Where $\partial H / \partial h_L < 0$.

[2] - As discussed in Rosati- Tzannatos (2003), similar results will be obtained if a non-altruistic model were used.

[3] - Endogenous fertility does make a difference to child labour analysis (See Rosati-Tzannatos 2003), but for the present analysis nothing of substance is changed by treating fertility as exogenous.

[4] - If capital market were present the efficient level of human capital investment will equalize returns to human capital investment to the market interest rate. Allowing for the presence of capital markets will complicate the exposition without bringing additional insights. For a discussion of the role of capital markets in determining child labour supply see Rosati- Tzannatos (2000).

[5] - Child labour could also contribute to human capital accumulation by, for example, on the job training. We do not consider this case in our discussion for two reasons. Firstly, there is no evidence to substantiate the statement on the role of child labor as a means to accumulate human capital. Secondly, formal education plays an empowerment role that goes beyond that of increasing the productivity of working time. This effect is captured in our model by introducing human capital as such as an argument of the utility function.

[6] - There are programs that try to make school hours more flexible to accommodate child labour activities, but their coverage is marginal and, in any case, such programs are not present in Pakistan.

Parents maximize a utility function defined over the current consumption of the household members, the current leisure and the future consumption of the children. Current household consumption C_1 is given by:

$$C_{1S}=y+w\,h_L-q \qquad (2)$$

if parents send their children to school.

Where y is the (exogenous) income of the parents, w is the wage rate (marginal product) of child labour, h_L are the hours of work supplied by children and q is the direct cost of education.

Future children's consumption, C_{2S}, is given by K+H where K is the exogenous endowment of human capital and H is defined in (1). Parents also attach value to the (current) leisure enjoyed by the children, $L= 1 - h_S - h_L$ (having normalised total available time to 1).

If parents do not send their children to school, present consumption is given by $C_{1L}= y + w\,h_L$, future consumption by $C_{2L} = K$ and current leisure by $L= 1- h_L$.

In both cases the choice variable is h_L (the time spent at work), but the money and time budget constraints are different according to whether the child is sent to school or not.

As the amount of time required by school attendance is fixed, the parent's choice of h_L is given by

$$\text{Max } [U_S^*(h_L), U_L^*(h_L)] \qquad (3)$$

where

$$U_S^* = \max_{h_L} \; U(y + w\,h_L - q, K + H(h_L; h_S), 1 - h_S - h_L; M) \qquad (4)$$

and

$$U_L^* = \max_{h_L} \; U(y + w\,h_L, K, 1 - h_L; M) \qquad (5)$$

and M represents a vector of household characteristics like education of the parents, locality of residence, etc. In other words, parents compare the maximized utility under the two regimes and select the one that yields the highest welfare.

The optimal decision regarding school enrolment, s, is given by:

$$s>0, \quad \text{if } U_S^* > U_L^* \text{ and vice versa.} \qquad (6).$$

The system (3) – (6) generates two behavioural equations in s and h_L , that can be expressed in reduced form as function of the set of exogenous variables discussed above.

The comparative statics properties of the model show that an increase in parent's income increases the probability that a child attends school and reduces the numbers of hours worked. An increase in the cost of schooling reduces human capital accumulation. These results, however, depend on the simplifying assumption of exogenous fertility and absence of capital markets. Relaxing such assumptions would not change the results relevant to the focus of the present paper, but it will make a difference for the discussion of child labour policies. A detailed analysis of these issues can be found in Rosati- Tzannatos (2003). Note that child labour supply is expected, other things being equal, to be lower when children are attending school, because of the negative effect on human capital accumulation and the higher marginal value of leisure. Also observe that corner solutions are possible in both regimes for h_L.

The econometric model

As illustrated in the Section 2, the decision of schooling and working are simultaneous. In particular we observe that a child is enrolled in school if $Us^* - U_L^* > 0 \Rightarrow s^* > 0$ and that the hours of work supplied by the children depend also on their enrolment status. We model hours worked and enrolment status using the following reduced form[7]:

$$s^* = Z'g + u \qquad (7)$$

$$h^* = X'b + \varepsilon \qquad (8)$$

h* are the hours worked, s* is the enrolment status of the child, ε and u are the disturbance terms following a bivariate normal distribution with zero means and variance co-variance matrix (Σ) as follows:

$$\Sigma = \begin{bmatrix} 1 & \sigma_{\varepsilon u} \\ \sigma_{\varepsilon u} & \sigma_{\varepsilon}^2 \end{bmatrix}.$$

We allow the two equations to be correlated via their error terms. One possible source of correlation is the unobservable (by the researcher) ability of the child. If children with higher abilities are more likely to go to school and work fewer hours, we expect a negative correlation between the two error components.

Both the enrolment rate and the hours worked are latent variables. Enrolment is observed as a dichotomous variable according to the following structure:

s=1 if s*>0

s=0 if s*<=0

As it is not possible to buy time, the hours worked are censored at zero. We assume that observed hours worked are described by the following Tobit model:

h=h* if h*>0
h=0 if h*<=0

The joint decision of working and studying is described by a simultaneous equation model that combines a Tobit and a probit model with correlated disturbances.
More specifically, each observation belongs to one of the four possible regimes:

1) Working hours>0, enrolled
2) Working hours=0, enrolled
3) Working hours>0,not enrolled
4) Working hours =0, not enrolled[8]

We estimate this model by maximum likelihood. The log likelihood function (L) for estimation of the parameters b, ρ and σ is given by:

$$L = \sum_{i\in 1} \ln p(s=1, h^* > 0) + \sum_{i\in 2} \ln p(s=1, h^* \le 0) + \sum_{i\in 3} \ln p(s=0, h^* > 0) + \sum_{i\in 4} \ln p(s=0, h^* \le 0)$$

3. The data sets

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[7] We drop the subscript L as no confusion can arise

[8] The probability associated to each of the regimes can be written as follows:

Pr (1)=P(h*>0)*P (s==1|h*>0) = $\phi(h^* - X'b, \sigma)\Theta\left(\frac{\left(Z'g + \rho\sigma^{-1}(h^* - X'b)\right)}{\sqrt{1-\rho^2}}\right)$

Pr (2)=P(s=1, h*<=0)= $\Theta 2\left(-X'b/\sigma, Z'g, -\rho\right)$

Pr (3)=P(h*>0)*P (s==0|h*>0)= $\phi(h^* - X'b, \sigma)\left(1 - \Theta\left(\frac{\left(Z'g + \rho\sigma^{-1}(h^* - X'b)\right)}{\sqrt{1-\rho^2}}\right)\right)$

Pr (4)=P(s=0, h*<=0)= $\Theta 2\left(-X'b/\sigma, -Z'g, \rho\right)$

where $\phi, \Theta, \Theta 2$ are respectively the univariate density function, univariate cumulative function, and the bivariate cumulative function.

We have employed two different data sets in the estimates: one survey conducted in Pakistan and the other survey in Nicaragua. It is interesting to test the determinants of hours of works and school enrolment with data relative to largely different economies and social structures. Moreover, the structure of children's employment in the two countries is different as in Pakistan a relatively larger number of children is working for a wage. This allows us to be more confident on the generality of the results obtained. Moreover, the structure of children's employment in the two countries is different as in Pakistan a relatively larger number of children is working for a wage.

Pakistan

The survey was carried out in 1996 and contains information on working children by age, sex, location, occupation and industry; on the working conditions of the children, i.e. hours worked, wages received and terms of employment as well as on the safety and health aspects of their workplace; and socio-economic characteristics of the children and their families. The Pakistan survey is part of the SIMPOC (Statistical Information and Monitoring Programme on Child Labour) survey led by ILO within the program on the elimination of Child Labour. It contains 10,453 households with an average household size of 8 individuals, for a total of 77,684 individuals. As the goal of the survey is to investigate working children's conditions, only households that reported child labour within the age group 5-14 years were interviewed. The sample, therefore, is representative of the subset of population of Pakistan households that have at least one child working..

On the basis of the estimate of the number of households with at least one working child (with respect to the total number of households), ILO-IPEC estimated that among the 40 million Pakistani children aged 5-14 years, 3.3 million, i.e. 8.3 per cent, were economically active during the reference week. During the 12-month reference period almost 8.1 per cent of the 40 million children reported that their principal activity was either working or being available for economic activity during most of the past 12 months[9].

In describing the data set utilized for the estimates, however, we refer to the statistics derived from the sample. The figures discussed, therefore, refer to the sample of households with at least a working child and not to the whole Pakistani population. Children aged between 5 and 14 amount to 30,772 in the sample. Table 1 shows the fraction of children who work and are enrolled in school programmes and also the

[9] - For details refer to the technical documentation that can be found in the ILO web site at www.ilo.org

fraction of full-time students and part-time workers among total children. The overall enrolment rate is about 40%, and there is a very large gender differential in enrolment rate at any age group. A large fraction of children cannot be classified in any of the three activities: "working only", "studying only", "working and studying". We define them as children with "no activity". Girls are more likely than boys to belong to the latter group: this is likely due to the fact that household chores are not classified, according to the questionnaire, as working activity.

Table 1: Children enrolled in school. Pakistan.

(as % of total number of children in each age group)

Age	Male	Female	Total
5	41.64	16.29	29.91
6	51.83	22.64	38.14
7	65.03	29.17	49.28
8	61.23	27.23	45.41
9	64.41	28.18	48.77
10	59.16	23.8	43.68
11	57.85	27.24	45.85
12	46.64	22.67	37.89
13	38.9	15.74	32.1
14	27.31	10.28	22.26
Total	49.41	22.69	38.79

Table 2: Children working only and Children working and studying. Pakistan. (as % of total number of children in each age group)

Age	Male	Female	Total
5	2.04	1.81	1.93
6	6.82	12.04	9.27
7	13.9	10.39	12.36
8	27.15	24.87	26.09
9	41.8	30.97	37.13
10	56.59	37.71	48.32
11	67.91	38.07	56.21
12	77.49	39.01	63.44
13	87.89	46.96	75.88
14	92.23	47.13	78.85
Total	55.91	29.81	45.54

Table 3: Children's activities by sex. Pakistan.

(as % of total number of children)

Activity	Male	Female	Total
Work only	36.35	27.49	32.83
Study only	29.85	20.36	26.08
Work and Study	19.56	2.32	12.71
No Activities	14.24	49.82	28.38
Total	100	100	100

Nicaragua

The Nicaragua survey refers to year 1998 and is part of the LSMS (Living Standards Measurement Study) survey[10]. There are 6,084 children aged 5 to 14 in the sample, representing the 28.8% of the total Nicaraguan sample.

The majority of children, about 73 per cent, attend school. The school attendance rate is higher for females than males at all ages. Most of the children study only (67 per cent of boys and 76 per cent of girls). Girls are less likely than boys to belong to the work. About 20 per cent of the children are apparently involved in no activity. Among them girls are the majority, this is perhaps due to the fact they are involved in household chores more than boys.

The tables 4-6 summarises the activities performed by children in the age group 6 to 14 in Nicaragua.

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Table 4: Children enrolled in school. Nicaragua

(as % of total number of children in each age group)

Age	Male	Female	Total
6	60.68	74.29	67.52
7	74.41	77.05	75.70
8	79.18	85.64	82.54
9	81.59	83.13	82.34
10	81.08	84.35	82.66
11	77.88	81.36	79.52
12	77.46	85.88	81.67
13	68.61	73.25	70.95
14	59.03	65.25	62.11
Total	73.49	79.06	76.25

Table 5: Children working only and working and studying. Nicaragua

(as % of total number of children in each age group)

Age	Male	Female	Total
6	0.57	0.56	0.57
7	4.96	0.55	2.80
8	4.40	1.90	3.10
9	8.78	2.11	5.55
10	15.02	3.19	9.29
11	17.88	3.73	11.20
12	21.68	5.76	13.71
13	31.39	7.32	19.26

[10] - The Living Standards Measurement Study was established by the World Bank in 1980 to explore ways of improving the type and quality of household data collected by government statistical offices in developing countries.

14	39.68	10.82	25.37
Total	15.41	3.84	9.68

Table 6: Children's activities by sex. Nicaragua
(as % of total number of children)

Activity	Male	Female	Total
Work only	8.61	1.07	4.88
Study only	66.69	76.29	71.44
Work and Study	6.81	2.77	4.81
No Activities	17.90	19.87	18.87
Total	100	100	100

5. Estimates of children's labour supply and school attendance.

The results of our Maximum Likelihood estimates for Pakistan and Nicaragua are presented in Table 8 and 9, respectively[11]. The coefficient of correlation ρ is negative in both estimates indicating that it would be inappropriate to estimate the two equations separately. This is confirmed also by the results of estimates from independent Probit and Tobit regressions shown in the Appendix (Tables A1 and A2). The estimated coefficients are different from those obtained by the Maximum Likelihood estimation: the difference is in several cases well above 10 per cent. It is beyond the scope of the present paper to try to define the direction of the bias and the characteristics of the correlation structure among the variables that are likely to influence the size and the direction of the bias itself.

The set of regressors used in the enrolment equation include the following variables for the Pakistani data: age, age squared, household income net of child earnings[12] (*HH Income*), household size (*hhsize*), number of children aged 6-14 (*Children*), number of children aged 0-5 (*Babies*), number of children aged 0-5 interacted with the female dummy variable (*Babiesf*), a dummy variable taking value of one if female, 0 otherwise (*Female*), a dummy variable taking value of one if the household resides in a rural area, 0 otherwise (*Rural*), and dummies variables taking value of one if the father (*Eduf*) or the mother (*Edum*) have at least completed primary education. A similar set of regressors has been used for Nicaragua. However, for Nicaragua, given the different characteristics of the sample, the education of the parents is represented by two

[11] Descriptive statistics are presented in Table 7.
[12] In order to obtain the total adults income, we first estimated children's wage using a two steps Heckman procedure, we then predicted the earnings for those children who do not work for a wage or for

dummies. The first dummy takes the value of one if the father/mother has completed the primary school (*Eduf/Edum prim*), the second takes the value of one if the father/mother has completed the secondary school (*Eduf/Edum secon*). Moreover, the data for Nicaragua did not allow separate adult from children's income, we then used total expenditures as a proxy of total household available resources.

Given the structure of the model we can compute the marginal effects conditioning on the latent status of children: enrolled or not, working or not. This will give information on the effects of exogenous variables differentiated by "latent" group of children. As we shall see, not negligible differences emerge among the various groups, indicating that policy effects of interventions might be differentiated according to the target selected.

Columns (a) and (b) of tables 8 and 9 report (respectively for Pakistan and Nicaragua) the marginal effects conditioned on the "latent" index of working hours being positive or not. Some of the explanatory variables have quite different effects on the two groups. The standard errors of the marginal effects are reported in the Appendix (Tables A3 and A4) in order to help to assess the extent to which they are statistically different. School enrolment is a non-linear function of age. Income has a positive effect on enrolment. However, the effect is much smaller for children with a high propensity to work with respect to the other group. The household composition effects are well determined. As we control for income these effects should mainly reflect the marginal productivity of children's time in the various activities. Again the marginal effects are differentiated across latent groups. Household size has a negative and small effect on the probability of attending school for the potentially working children, while it has a strong and significant positive effect on the other group. As we control for income, this is likely to be a marginal productivity effect. In households that are not likely to send their children to work, substitutability between adult and child work appears to be stronger than in the other group. An additional child aged 6-14 in the household negatively affects the enrolment rate for the non working children in both countries. The presence of preschool age children reduces the enrolment probability for those children who are not likely to work, while is has the opposite effect for those children who are likely to work. This effect is more pronounced for the girls, even though in Nicaragua it is only significant at 10% level. Children living in rural areas are also less likely to be enrolled in school. The presence of a significant gender differential in enrolment is confirmed by the estimates in both countries, albeit in opposite directions. Girls are less likely to be at

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whom wage data are not available. We obtained the total adult income by netting out the predicted child earnings from the household income.

school in Pakistan and the probability of being enrolled decreases further if there are preschool age children in the household, as shown by the negative coefficient of *Babiesf* (the interaction between the number of young children present in the household *Babies* and the dummy for being a girl, *Female*). In contrast, girls have higher chances than boys to be enrolled in school in Nicaragua. However, the chances of attending school are reduced if there are preschool age children in the household.

Columns (c) and (d) of tables 8 and 9 show the marginal effects on working hours computed conditioning on the latent enrolment/non enrolment status of the working child[13]. As it is easy to see, once the covariance in the errors is taken into account, the marginal effects are quite different from the estimated coefficients. An increase in income reduces the numbers of hours worked by the children, with a stronger effect in the case of children that are likely not to be in school. Household size has a negative effect on hours worked: children belonging to larger households do work fewer hours, if they work. The presence of an additional preschool age child increases the number of hours worked. This effect is more pronounced for girls (though not significant for girls enrolled in school in Nicaragua), as shown by the positive coefficient of *Babiesf*. In Nicaragua, children with an additional school age child in their household increase the daily hours worked of more than an hour.

Girls work shorter hours than the boys: this is probably due to the fact that household chores are not recorded as working activities in the survey. Children working in rural areas are less likely to attend school, but they work fewer hours with respect to children working in urban areas.

The results obtained are similar for Nicaragua and Pakistan. The main differences are given by the effects of the number of school age children and of the area of residence. Children belonging to household with larger numbers of school age children tend to work longer hours in Nicaragua, while we observe a small negative effect of this variable in Pakistan. Living in rural area increases the numbers of hours worked, contrary to what we observe for Pakistan.

6. Conclusions

[13] The marginal effects in column (c) were obtained by differentiating with respect to each regressor the expected value of the hours worked conditional on the enrolment and working status of the child (Maddala, 1993): E(h|h*>0,s*>0) = $\beta' X + \frac{\sigma}{\Phi_2(X'\beta, Z'g, \rho)}\left(\phi(-X'\beta/\sigma)\Phi\left(\left(1-\rho^2\right)^{-1/2}\left(Z'g - \rho X'\beta/\sigma\right)\right) + \rho\left(-Z'g\right)\Phi\left(\left(1-\rho^2\right)^{-1/2}\left(X'\beta/\sigma - \rho Z'g\right)\right)\right)$. Total marginal effects of the enrolment probability conditional on the working status of the child in column (a) are derived by partially differentiating the enrolment probability with respect to each regressor: E(s*>0||h*>0)= $\Phi_2(X^{*\prime}\beta^*, Z'g, \rho)/\Phi(X^{*\prime}\beta^*)$

The literature on child labour has to some extent neglected to analyse the determinants of the hours worked by the children. The attention has been mainly devoted to the household decision to send the children to school and/or to work. The duration of the working day is, however, important to assess the impact of work on the human capital accumulation and on the child's health. Starting from a simple theoretical framework, we have derived and estimated a simultaneous equation system for estimating the household's decision relative to the school enrolment and to the hours worked by their children. The results show the importance of taking into account the simultaneity of the decision about schooling and hours worked in order to assess the importance and the role played by different explanatory variables. The effects of the variables on the hours worked then depend also on the change they induce in the probability that a child is sent to school through the correlated error terms of the two equations.

Moreover, the structure of the model we have estimated allow us to compute the marginal effects conditional on the latent variable indicating the "propensity" of the household to send the child to work or not. These marginal effects may be very different among the two "groups" and show that policy action can have a different impact depending on whether the child is likely to be sent to work or not.

Consider for example the case of income. The results indicate that policies aiming at reducing child labour by introducing incentive schemes (like income transfers) that only marginally modify the opportunity set of the household are likely to produce more significant effects on those households that are at the margin between sending their children to work or to school, i.e. that have a low propensity to child labour. Such schemes are hence likely, if not properly targeted, to be ineffective toward those households, most likely the poorest and most uneducated, that hence have a high propensity to send their children to work.

Table 7. Descriptive statistics

Variables	**Pakistan**		**Nicaragua**	
	Mean	Standard deviation	Mean	Standard deviation
	(1)	(2)	(1)	(2)
Weekly hours worked	15.72	20.74		
Daily hours worked			0.68	2.11
Weekly hours worked if working	35.29	16.59		
Dailly hours worked if working			5.94	2.77
Age	10.14	2.780	9.82	2.58
Hh size	8.46	3.54	7.74	2.99
Babies	1.38	1.30	3.13	1.45
Children	3.55	1.48	1.04	1.07
HH (net) income	2968.34	2588.09		
HH income			4779.45	5894.62
Female	0.389	0.487	0.49	0.50
Rural	0.435	0.496	0.55	0.50
Father education: primary	0.267	0.442	0.42	0.49
Father education: secondary or more			0.19	0.40
Mother education: primary	0.053	0.225	0.44	0.50
Mother education: secondary or more			0.16	0.37
Number of observations	27512		4278	

Note: the samples considered for Pakistan and Nicaragua consist of children aged 5-14 and aged 6-14, respectively

Table 8. ML estimates of enrolment and hours worked. Pakistan

	Coef.	P>z	marginal effect| work	marginal effect| not work		Coef.	P>z	marginal effect| enrolled	marginal effect| not enrolled
	Enrolment				**Hours**				
Regressors			(a)	(b)				(c)	(d)
Age	0.592	0.000	0.192	0.459	Age	18.762	0.000	4.712	3.899
age2/100	-3.339	0.000	**-0.205**	-2.178	age2/100	-49.515	0.000	-1.308	2.817
Hhsize	0.038	0.000	-0.006	0.021	Hhsize	0.033	0.782	-0.221	-0.264
Children	0.023	0.011	-0.061	-0.014	Children	-3.686	0.000	-1.798	-1.794
Babies	-0.051	0.000	0.035	-0.015	Babies	1.685	0.000	1.073	1.116
Babyf	-0.127	0.000	0.067	-0.047	Babyf	2.924	0.000	2.104	2.221
HH income /1000	0.032	0.000	0.008	0.016	HH income /1000	-0.173	0.036	-0.278	-0.313
Female	-0.375	0.000	-0.133	-0.173	Female	-28.744	0.000	-8.389	-11.25
Rural	-0.048	0.004	-0.018	-0.021	rural	-1.307	0.001	-0.603	-0.768
Eduf	0.620	0.000	0.245	0.237	Eduf	-5.115	0.000	-0.401	-0.927
Edum	0.460	0.000	0.179	0.181	Edum	-3.760	0.000	-0.266	-0.714
Constant	-2.966	0.000			Constant	-115.923	0.000		
ro:	-0.643								

Observations: 27512. Observations used in the regression are less than the total number of children in the sample due to non valid cases for some of regressors used in the estimates.
Mean squared root error: 27.2 (p-value:0.000);
covariance errors: -17.5 (p-value 0.00).
Dependent variable: weekly hours worked.
First column indicates the parameter corresponding to each regressor, the second the p-value. The third and fourth column refers to the hours equation and show the marginal effect of each regressor conditioned to enrolment=1 and enrolment=0 respectively.
The standard errors of the marginal effects (col a, b, c, d) are reported in Appendix. All the marginal effects were found significant at 5% level with the exception of those reported in bold

Table 9. ML estimates of enrolment and hours worked. Nicaragua

	Coef.	P>z	marginal effect| work	marginal effect| not work		Coef.	P>z	marginal effect| school	marginal effect| not school
	Enrolment				**Hours**				
Regressors			(a)	(b)				(c)	(d)
Age	0.777	0.000	0.464	0.174	Age	3.092	0.001	5.161	-2.792
age2	-0.041	0.000	-0.011	-0.009	age2	-0.059	0.165	**-0.113**	0.177
Hhsize	0.0386	0.005	-0.070	0.009	Hhsize	-0.564	0.000	-0.834	-0.357
Children	-0.035	0.149	0.076	-0.008	Children	0.603	0.009	0.896	0.350
Babies	-0.132	0.000	0.161	-0.029	Babies	1.316	0.000	1.922	1.034
Babyf	-0.067	0.108	**-0.041**	-0.015	Babyf	-0.278	0.515	**-0.463**	0.238
HH income /1000	0.0968	0.000	**0.010**	0.022	HH income /1000	0.016	0.749	**0.082**	-0.460
Female	0.2295	0.001	0.007	0.046	Female	-6.083	0.000	-0.804	-1.109
Rural	-0.362	0.000	**-0.108**	-0.105	Rural	3.196	0.000	0.470	0.673
Eduf primary	0.2562	0.000	0.104	0.072	Eduf primary	-0.900	0.072	-0.073	-0.095
Eduf secondary	0.4575	0.000	0.180	0.229	Eduf secondary	-0.914	0.281	-0.020	0.001
Edum primary	0.3073	0.000	0.124	0.084	Edum primary	-1.524	0.002	-0.161	-0.214
Edum secondary	0.4901	0.000	0.192	0.123	Edum secondary	-3.791	0.000	-0.453	0.612
Constant	-3.298	0.000			Constant	-32.186	0.000		
Ro	-0.344								

Observations: 4278. Observations used in the regression are less than the total number of children in the sample due to non valid cases for some of regressors used in the estimates.
Mean squared roort error: 8.32 (p-value:0.000); covariance errors-2.860 (p-value 0.00). Dependent variable: daily hours worked.
First column indicates the parameter corresponding to each regressor, the second the p-value. The third and fourth column refers to the hours equation and show the marginal effect of each regressor conditioned to enrolment=1 and enrolment=0 respectively.
The standard errors of the marginal effects (col a, b, c, d) are not reported as all the marginal effects were found significant at 5% level with the exception of those reported in bold

APPENDIX

Tab A1. Probit estimates for enrolment rate and Tobit Estimates for hours worked. Pakistan

	Coef.	P>z		Coef.	P>z
	Enrolment		**Hours**		
Regressors					
age	0.625	0.000	Age	20.862	0.000
age2	-0.035	0.000	age2/100	-0.581	0.000
hhsize	0.040	0.000	Hhsize	-0.034	0.790
children	0.027	0.004	Children	-3.930	0.000
babies	-0.053	0.000	Babies	1.786	0.000
babyf	-0.140	0.000	Babyf	2.951	0.000
			HH income	-0.102	0.246
incnet	0.031	0.000	/1000		
female	-0.358	0.000	Female	-29.258	0.000
rur1	-0.043	0.009	rural	-0.440	0.305
edu_f	0.624	0.000	Eduf	-4.841	0.000
edu_m	0.441	0.000	Edum	-3.054	0.002
_cons	-3.110	0.000	Constant	-128.238	0.000

Total observations 4278: 27512

Probit results. Likelihood Value: -64936.238. LR chi2(11) : 4332.80

Tobit results. Mean squared root error: 28.09235 . Likelihood Ratio chi2(11) = 15817.44

Tab A2. Probit estimates for enrolment rate and Tobit Estimates for hours worked. Nicaragua

	Coef.	P>z		Coef.	P>z
	Enrolment		**Hours**		
Regressors					
Age	0.796	0.000	Age	3.362	0.000
age2	-0.042	0.000	age2	-0.070	0.111
Hhsize	0.023	0.074	Hhsize	-0.593	0.000
Children	-0.047	0.042	Children	0.604	0.011
Babies	-0.131	0.000	Babies	1.341	0.000
Babyf	-0.074	0.072	Babyf	-0.317	0.476
HH inc/1000	0.000	0.001	HH inc /1000	0.000	0.998
Female	0.238	0.000	Female	-6.243	0.000
Rural	-0.442	0.000	Rural	3.074	0.000
Eduf prim	0.277	0.000	Eduf prim	-1.098	0.033
Eduf sec	0.528	0.000	Eduf sec	-1.312	0.133
Edum prim	0.344	0.000	Edum prim	-1.402	0.005
Edum sec	0.527	0.000	Edum secry	-3.719	0.000
Constant	-2.961	0.000	Constant	-33.566	0.000

Tot observations 4278.

Probit estimates. Likelihood Ratio chi2(13): 717.61

Tobit . Mean squared root error 8.494859. Likelihood Ratio chi2(13): 709.10

Table A3. Standard errors and confidence interval for marginal effects. Pakistan

Regressors	Marginal effect	Stadard errors	Confidence intervals			Marginal effect	Standard errors	Confidence intervals	
Enrolment| working					**Hours|working and schooling**				
Age	0.192	0.010	0.172	0.212	Age	4.712	0.276	4.171	5.253
age2/100	-0.205	0.053	-0.309	-0.101	age2/100	-1.308	0.1336	-1.570	-1.046
Hhsize	-0.006	0.001	-0.008	-0.004	Hhsize	-0.221	0.018	-0.256	-0.186
Children	-0.061	0.002	-0.065	-0.057	Children	-1.798	0.033	-1.863	-1.733
Babies	0.035	0.002	0.031	0.039	Babies	1.073	0.032	1.010	1.136
Babyf	0.067	0.004	0.059	0.075	Babyf	2.104	0.055	1.996	2.212
Hhinc/1000	0.008	0.001	0.006	0.010	HHinc/1000	-0.278	0.016	-0.309	-0.247
Female	-0.133	0.008	-0.149	-0.117	Female	-8.389	0.207	-8.795	-7.983
rural	-0.018	0.007	-0.032	-0.004	rural	-0.603	0.216	-1.026	-0.180
Eduf	0.245	0.008	0.229	0.261	Eduf	-0.401	0.044	-0.487	-0.315
Edum	0.179	0.016	0.148	0.210	Edum	-0.266	0.097	-0.456	-0.076
Enrolment |not working					**Hours|working and no schooling**				
Age	0.459	0.205	0.057	0.861	Age	3.899	1.07	1.802	5.996
age2/100	-2.178	1.052	-4.240	-0.116	age2/100	**2.817**	5.629	-8.216	13.850
Hhsize	0.021	0.002	0.017	0.025	Hhsize	-0.264	0.031	-0.325	-0.203
Children	-0.014	0.001	-0.016	-0.012	Children	-1.794	0.003	-1.800	-1.788
Babies	-0.015	0.003	-0.021	-0.009	Babies	1.116	0.008	1.100	1.132
Babyf	-0.047	0.001	-0.049	-0.045	Babyf	2.221	0.027	2.168	2.274
HH inc /1000	0.016	0.005	0.006	0.026	Hhinc/1000	-0.313	0.033	-0.378	-0.248
Female	-0.173	0.008	-0.189	-0.157	Female	-11.25	0.004	-11.258	-11.242
rural	-0.021	0.001	-0.023	-0.019	Rural	-0.768	0.016	-0.799	-0.737
Eduf	0.237	0.005	0.227	0.247	Eduf	-0.927	0.004	-0.935	-0.919
Edum	0.181	0.004	0.173	0.189	Edum	-0.714	0.002	-0.718	-0.710

Table A4. Standard errors and confidence interval for marginal effects. Nicaragua

Regressors	Marginal effect	Stadard errors	Confidence interval			Coef.	Standard errors	Confidence interval	
Enrolment| working					**Hours|working and studying**				
Age	0.464	0.126	0.217	0.711	Age	5.161	1.994	1.254	9.068
age2	**-0.011**	0.006	-0.023	0.001	age2	**-0.113**	0.075	-0.261	0.035
Hhsize	-0.07	0.020	-0.109	-0.031	Hhsize	-0.834	0.256	-1.336	-0.332
Children	0.076	0.029	0.019	0.133	Children	0.896	0.385	0.141	1.651
Babies	0.161	0.041	0.081	0.241	Babies	1.922	0.623	0.701	3.143
Babyf	**-0.041**	0.049	-0.137	0.055	Babyf	**-0.463**	0.565	-1.571	0.645
HH inc/1000	0.013	0.005	0.003	0.023	HH inc/1000	0.082	0.000	0.082	0.082
Female	**0.007**	0.039	-0.069	0.083	Female	-0.804	0.084	-0.969	-0.639
Rural	-0.108	0.025	-0.157	-0.059	Rural	0.47	0.110	0.255	0.685
Eduf primary	0.104	0.026	0.053	0.155	Eduf primary	**-0.073**	0.100	-0.268	0.122
Eduf sec	0.18	0.040	0.102	0.258	Eduf sec	**-0.021**	0.147	-0.310	0.268
Edum prim	0.124	0.026	0.073	0.175	Edum prim	**-0.161**	0.101	-0.360	0.038
Edum sec	0.49	0.047	0.398	0.582	Edum sec	-0.453	0.140	-0.728	-0.178
Enrolment |not working					**Hours|working and not studying**				
Age	0.174	0.024	0.127	0.221	Age	-2.792	0.080	-2.950	-2.634
age2	-0.009	0.001	-0.011	-0.007	age2	0.177	0.006	0.165	0.189
Hhsize	0.009	0.003	0.003	0.015	Hhsize	-0.357	0.037	-0.430	-0.284
Children	**-0.008**	0.005	-0.019	0.003	Children	0.35	0.046	0.260	0.440
Babies	-0.029	0.007	-0.043	-0.015	Babies	1.034	0.099	0.840	1.228
Babyf	**-0.015**	0.009	-0.033	0.003	Babyf	0.238	0.040	0.159	0.317
HH inc/1000	0.100	0.001	0.097	0.103	HH nc/1000	-0.46	0.001	-0.462	-0.458
Female	0.046	0.019	0.008	0.084	Female	-1.109	0.112	-1.328	-0.890
Rural	-0.105	0.021	-0.146	-0.064	Rural	0.673	0.144	0.391	0.955
Eduf prim	0.072	0.017	0.038	0.106	Eduf Prim	**-0.095**	0.136	-0.362	0.172
Eduf sec	0.229	0.024	0.181	0.277	Eduf sec	**0.001**	0.206	-0.403	0.405
Edum prim	0.084	0.017	0.050	0.118	Edum prim	**-0.214**	0.139	-0.487	0.059
Edum sec	0.123	0.023	0.078	0.168	Edum sec	0.612	0.197	0.225	0.999

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