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Mothers' Employment and their Children's Schooling: A Joint Multilevel Analysis for India*

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Abstract

This paper studies the relation between mothers' employment and their children's schooling in India, where a high number of children are not attending school at compulsory school age. Using the second National Family Health Survey, the results of a joint multi-level random effects model show that, controlling for covariates, the correlation between mothers' employment and children's schooling is negative. A sensitivity analysis on wealth and education deciles shows that this relation disappears in urban areas and becomes weaker in rural areas only at the top wealth deciles, but persists for the more educated mothers. The last result may be driven by the low number of females with a high level of education in India, but it also seems to envisage that, for mothers with lower education, being literate does not increase pay conditions. These findings suggest that policies aiming at improving both women's and children's welfare should not only pursue higher levels of education, but also target improvements in women's conditions in the labour market.

JEL Classification: J13; J22; O15; O18.

KEYWORDS: women's employment, children's schooling, household allocation of time, random effects, India, NFHS-2.

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1 Introduction

Child schooling is universally acknowledged as one of the prerequisites of human development. However, official statistics show that school enrolment as a percentage of the population of children aged 5 to 14 years may vary considerably among less developed countries.[1] In the poorest regions of the developing world, there are still many factors that constrain households' decisions concerning investment in children's human capital. For families in poverty children's education can result in being a luxury good, unaffordable with the available resources (Basu and Van, 1998). Unexpected shocks, such us their own or other household members' illness, or adults' unemployment may also negatively affect children's school attendance (Duryea et al., 2007). Even households that are neither facing risks nor particular resource constraints may decide not to invest in children's education when the comparative return of child work is higher with respect to the returns to education (Chamarbagwala, 2007). When the immediate benefit deriving from child labour to households outweighs the future loss in terms of lower returns to education, the child labour choice is still a rational choice aimed at the optimization of the child's (or family's) well-being in the long run (Cigno, 2004).

Although child labour does not always compete with schooling and some children manage to combine work and study activities, an extensive literature shows that the time children dedicate to work has negative effects on their education (Psacharopoulos, 1997; Patrinos and Psacharopoulos, 1997). Ryan and Lancaster (2004), for example, examining the trade-off between child labour and schooling for seven countries, find that the time children devote to work generally negatively affects their school performance and increases the probability of dropping out.[2] On the earnings side, Beegle et al. (2009) estimate that the forgone earnings attributable to lost schooling exceed any earnings gain associated with child labour, and that the net present discounted value of child labour is positive for very high discount rates.

In many cases children contribute substantially with their work helping their families to meet subsistence needs (Edmond, 2005, 2008). Some studies show that children who are paid for their work may earn up to one fifth of family income (see for example Degraff and Levison, 2009). Even when involved in unpaid activities, children substitute for other family members in household work or work for the family business, allowing adults to employ their time in the labour market (Cigno and Rosati, 2005). Given the evidence on the connection between children's activities and household income, the relation between children's school attendance and their parents' employment represents a crucial issue to be further investigated. Also, distinguishing between fathers' and mothers' employment may add some relevant features to the analysis. While data show high male participation rates in employment worldwide, the same evidence is not observed for females (see Table 1a in ILO, 2006-2007). Moreover, most female workers in developing countries, particularly in

[1] In 2002/3 the average enrolment rate in the World Education Indicators (WEI) countries was 92 per cent, while in OECD countries it was 97 per cent. The countries surveyed in the WEI are Argentina, Brazil, Chile, China, India, Indonesia, Jordan, Malaysia, the Philippines, the Russian Federation, Thailand, Egypt, Jamaica, Paraguay, Peru, Sri Lanka,Tunisia, Uruguay and Zimbabwe (OECD-UNESCO, 2005).

[2] In some cases (e.g. Sri Lanka) they find the marginal impact of child labour to be positive.

South Asia and Africa, do not have salaried jobs, being involved in paid economic activities much less than male workers. Women often produce goods at home for market sale, work on the family farm, or work in a small family-run business.[3] This kind of employment is very common in South Asia, where it represented 64.6 and 51.7 per cent of total female employment in 1998 and 2008 respectively, the highest figures among the world regions (Table 3 in ILO, 2006-2007). Wage and salaried female workers, instead, amounted to 10 per cent and 14.5 per cent of female employment in 1998 and 2008 respectively, while the corresponding figures for males were 21 and 24.4 per cent. Furthermore, most women in developing countries are engaged in economic activities that do not normally figure in labour statistics or are not recognised as work at all, such as subsistence agriculture and housework. As documented by several time use surveys for developing countries, women have to decide, more often than men, how to distribute their time among child care, domestic work, work for a family business and/or outside work activities (Budlener, 2008).[4]

While economists have studied separately children's schooling (see for example Glewwe, 2002; Dostie and Jayaraman, 2006; Ota and Moffatt, 2007) and female employment (see for example Mathur, 1994; Mammen and Paxson, 2000; Olsen and Mehta, 2006; Bhalotra and Umana-Aponte, 2010) in developing countries, a few studies address the potential nexus between children's schooling and women's earnings or economic autonomy (see for example Kambhampati, 2009). Although there is some concern on the social benefits deriving from female work on children's schooling - a mother staying home to teach her children may yield a greater social return in terms of the growth of human capital than if she goes to work (Behrman and Rosenzweig, 2002; Behrman et al., 1999) - the empowering function of employment for women is hardly denied. In fact, even if the level of female education has improved in recent years, the rate of illiteracy among mothers in many developing countries remains dramatically high and only a small percentage of mothers are able to engage in teaching and training their own children (see, for India, Motiram and Osberg, 2008). Instead, several studies show that women who contribute to household resources through a paid activity have a higher command of them, since earnings from their own work represent an easier resource to control (Desai and Jain, 1994; Basu, 2006; Anderson and Eswaran, 2009). Another question is, therefore, if the greater social weight gained by women through labour income is reflected in an increase in the well being of their children, also in terms of guaranteeing their access to compulsory schooling.

This paper focuses on the role of mothers' employment for children's schooling in a developing country. Theoretically the relationship between mothers' employment and children's schooling could be either positive or negative. A positive relation would arise because of an income effect, according to which mothers' employment would increase household income and the probability of studying of children. On the other hand, mothers who run their own business or work as employees might involve their children in these activities - if their expected return is higher than that of education - thus reducing their time for schooling. Alternatively, even if not directly involved in production activities, children could be required to substitute for their mothers at work in house-

[3] According to ILO definitions these are called "contributing family workers".

[4] The countries studied are Argentina, Nicaragua, India, Corea, South Africa and Tanzania.

hold chores or in the care of siblings or of other household members. In these cases a negative relationship between mothers' employment and children's schooling would emerge.

The question of whether mothers' employment and children's schooling are related is relevant for policy in at least two respects. First, if a relation between child schooling and mothers' work exists, any programme for the improvement of the female condition in the labour market will have consequences for child schooling. If this relation is negative, a natural conclusion would be that policy makers should be very cautious in designing measures to sustain female employment, since they may have the undesired effect of reducing children's school attendance. Policy makers should be able to understand through which channels mothers' employment affects their children's schooling and develop programmes that both support women's employment and children's rights. For example, women who have benefited from incentives for becoming self-employed, or of programmes for accessing micro-credit to start a business might be induced to also involve their children in a working activity. Second, the existence of a negative relation in a situation of subsistence might indicate that past employment policies have not helped solve the problem of poverty, since an easier access to employment does not necessarily guarantee a sufficient improvement in household income. If no attention is paid to the quality of jobs held by women - in terms of wage and pay conditions - a "bad job", neither helping to exit from poverty nor producing "empowering" effects, is likely to reduce child schooling. For example, a mother in need who finds a badly paid job might take her child to work with her to raise a little more money. These simple arguments give an idea of how complex the task of designing policy measures aimed at improving the welfare of both mothers and children is.

The scope of this paper is much more circumscribed and must be regarded as a first attempt at investigating if there is indeed a relation between children's schooling and mothers' employment. We study the case of India, a country in which school attendance of children is still problematic. Education is compulsory for children aged 6-14 years, but school drop-out rates are very high and labour market opportunities for women are very poor.[5] Using a sample of mothers and children drawn from the National Family Health Survey for 1998/9 (NFHS-2), we estimate a joint multilevel random effects model for mothers' employment and children's school attendance.

The paper is structured as follows. Section 2 illustrates the research background and strategy. Section 3 outlines the econometric model, Section 4 describes the data and the variables, Section 5 presents and discusses the results. Section 6 concludes.

2 Research background and strategy

In a simple family labour supply model, apart from their own income and substitution effects of a change in their own wage, each family member's labour supply is potentially affected by cross-substitution and income effects arising from a change in the other members' wages. When family

[5]Drop-out rates were 40 per cent for primary school and 54.5 per cent in 1999-2000 (World Data on Education, 2007).

resources are pooled together, as the wage increases for any family member the income effect considered alone would induce the other family members to increase their consumption of non market work time (total available time minus time spent working in the market) and decrease hours worked in the market. The substitution effect, in contrast, implies that the person whose wage has improved would work more in the market and other family members may work less. In order to investigate the relation between mothers' employment and children's schooling, we may start considering the mother's participation decision in a framework where parents decide for their children. For our purpose, it is not crucial to distinguish between a unitary or collective approach to household utility maximization. We may assume that parents maximize either a unitary utility function, or that the mother maximises her own separate utility where time children spend in school is one of the arguments, together with domestic and market goods, given the father's hours of market work and unearned income. The inclusion of time spent in school by children in the utility function can have a double interpretation. First, an altruistic interpretation, according to which, the mother derives utility from the fact that her children go to school. The parental altruism assumption goes mainly unchallenged in the theoretical literature on child labour (e.g. Basu and Van, 1998; Baland and Robinson, 2000) and some empirical support to it may be found in Manacorda (2006). The second interpretation is egoistic, since the mother may guarantee herself future consumption through her child support, investing in her/his education (see for India Cigno, 2006).

We also have to take into account the domestic work that would normally be performed by mothers and children. Thus, if female wages increase, some mothers may decide to participate if their reservation wages are lower than the market wage, thus reducing their domestic work and/or leisure. Family income would increase, if their earnings are pooled with their partners' earnings. The income effect alone would lead to an increase in non market work time for the other members and, in particular, for children it may become more probable to be sent to school, since the family may be able to afford it, thus giving rise to a positive relation between children's schooling and mothers' work. However, it may also happen that female earnings are not high enough to allow the schooling of children and/or to ease the production of domestic services by means of goods and services bought in the market, so that children are left idle, or are employed in domestic work to substitute for their mothers, or are employed in market activities. In all these cases a negative relation between mothers' employment and children's schooling would appear. If female wages increase, more mothers will participate, and already employed mothers may decide, because of their own wage substitution effect, to supply more hours of work. However, a positive relation between mothers' work and children schooling would only appear, all else being equal, through an income effect whereby female earnings contribute to reach a sufficient family income for sending children to school.

Of course, the decision concerning children's activities would also depend on fathers' earnings, on children's wages, on their domestic productivity and on returns to schooling. Differentials in adults' and children's wages would also affect the interaction between income and the substitution effects at family level. Leisure time is a more expensive commodity for higher-wage workers and a relatively cheaper commodity for lower-wage workers. If the mother's wage is higher than that

of her children[6] then she might have an incentive to cut back on her consumption of leisure and increase her labour supply. Francavilla and Giannelli (2010) found that complementarity between mothers' and children's market work is essentially a rural phenomenon. This seems to suggests that for families in poverty who live in circumstances in which women have access only to bad quality jobs and low wages a negative correlation between mothers' work and children's schooling is observed.

From the labour demand side, as stated by the substitution axiom in Basu and Van (1998), there are reasons to expect that from a firm's point of view mother's labour and child labour are substitutes, thus leading to a positive relationship between mother's employment and children's schooling. However, there are also many circumstances in which one can envisage a complementarity between mothers' and children's work particularly in developing countries where women are mainly involved in "informal" occupations. It is easy to imagine, for example, children helping mothers involved in self-employment activities or small family businesses or mothers who work in plantations as pieceworkers bringing their children with them to increase their production. The ownership of certain family assets may affect both mothers' and children's productivity. In fact, while assets generally produce wealth effects that tend to reduce market work, some of them increase the return of family members' time devoted to work and the cost of sending children to school. In his study on Ethiopia, for example, Cockburn (2001) finds that some assets (e.g. livestock, small animals and crops) increase child labour, whereas others (e.g. land fertility, oxen, ploughs and proximity to water) reduce it. Bhalotra and Heady (2004) find evidence that children in land-rich households are often more likely to work than children in land-poor households (the so called *wealth paradox*) and assert that child labour is positively correlated with family land ownership when both the land and the labour market are imperfect. Rosenzweig and Wolpin (1985) show that, even in the presence of perfect markets, household intergenerational extension and child labour profitability subsist because of returns to specific experience. Although there are no studies on these topics that focus on the relationship between mothers' work and children's work, it can be expected that assets ownership positively correlated with children's work may also be positively correlated with mothers' work.

This study aims at analysing the relationship between children's time use and mothers' time use in a joint framework in which both mothers' work activities and children's activities are endogenous. The empirical model is compatible with the above assumption that the decision process takes place in the family where the mother (or the parents) decide about her (their) and her (their) children's time allocation. In our reduced form empirical model the optimal mother's and children's time allocation decision depend on the mother's and her partner's characteristics, on children's characteristics and on household characteristics. The two observed outcomes are the working status of the mother and the schooling status of each one of her children. The hypothesis of simultaneity of decisions holds true under the assumption that children's time enters the utility function of mothers, in such a way that mothers decide how to allocate their children's time while maximizing their own utility function. We therefore assume that working and schooling statuses are determined by

[6]Perhaps because they are less productive as assumed in Basu and Van (1998) and Basu and Tzannatos (2003).

the two underlying mother's utilities for working and for sending each child to school. The model is multi-level, with a mother-level and a child-level. We specify a two-equation linear model for these utilities under the assumptions that children of the same mother share the same mother-level error such that the child equation becomes a random effects probit. Also, the mother equation has an error structure that allows for correlation between the mother and child equations.

We aim at estimating the effects of some relevant covariates, such as education of parents, father's occupation and household wealth on the two outcomes, and also two correlations, namely, the residual correlation of the utilities of working and sending each child to school (mother-child correlation), and the residual correlation of the utilities of schooling among siblings of the same mother (within class correlation). As far as we know, this is the first study on women's participation and children's schooling, and also the first one to employ a multi-level structure of household time allocation. A significant value of the mother-child correlation estimated with this technique may imply a joint nature of the time allocation decisions of mothers regarding their own and their children's time. The sign and the size of this correlation may be interpreted as evidence on the direction and magnitude of the relation between children's schooling and their mothers' work. Moreover, the within class correlation allows us to take into account the correlation among siblings in the same family. If this correlation is strong and significant, this means that siblings' outcomes are strongly related, thus justifying the use of a multi-level analysis.

Two related papers analyzing the relationship between child work and mother employment are Degraff and Levison (2009) for Brazil and Francavilla and Giannelli (2010) for India. Our analysis is different for both the focus - child schooling rather than child work - and the statistical model. Specifically, the model outlined in Section 3 fully addresses the main features of the phenomenon, namely the multivariate nature of the outcome (employment status of the mother and schooling statuses of all her children separately) and the multi-level structure (children nested into mothers). On the contrary, Francavilla and Giannelli (2010) summarize the multivariate outcome of each family into a single multi-category outcome to be studied with multinomial logit regression, while Degraff and Levison (2009) use a bivariate probit approach that explicitly models the mother-child relationship but fails to properly address the multilevel structure.[7]

3 A multilevel joint model for mother's work and children's schooling

We devise an econometric model apt to shed light on the research questions outlined in Section 2. Let $j = 1, \ldots, J$ denote mothers and $i = 1, \ldots, n_j$ denote children aged 6-14 of mother j. The observed outcomes are the working status of the mother, $y_j^{(m)}$ (1 = working, 0 = otherwise), and the

[7]Indeed, for the families with multiple children, they duplicate the record of the mother as many times as the number of her children.

schooling status of each of her children aged 6-14, $y_{ij}^{(c)}$ (1 = attending school, 0 = otherwise). We assume that working and schooling conditions are determined by the *net underlying utilities* of the mother:

$$\{y_j^{(m)} = 1\} \Leftrightarrow \{\tilde{y}_j^{(m)} > 0\} \qquad \text{with } \tilde{y}_j^{(m)} = \text{utility of mother } j \text{ for working}$$
$$\{y_{ij}^{(c)} = 1\} \Leftrightarrow \{\tilde{y}_{ij}^{(c)} > 0\} \qquad \text{with } \tilde{y}_{ij}^{(c)} = \text{utility of mother } j \text{ for sending her child } i \text{ to school}$$

The covariates determining the utilities are distinguished into child-level covariates z_{ij} (child's age and gender) and mother-level covariates x_j (every covariate that is constant for a mother, such as mother's age and education, household structure, partner's occupation, household's wealth, geographic area). We assume that the joint model for the utilities has two linear equations:

$$\tilde{y}_j^{(m)} = \alpha^{(m)} + \beta^{(m)} x_j + u_j^{(m)} + e_j^{(m)} \quad \text{(mother equation)} \tag{3.1}$$
$$\tilde{y}_{ij}^{(c)} = \alpha^{(c)} + \beta^{(c)} x_j + \gamma^{(c)} z_{ij} + u_j^{(c)} + e_{ij}^{(c)} \quad \text{(child equation)} \tag{3.2}$$

with the following assumptions on the errors:

1. The u-errors $(u_j^{(m)}, u_j^{(c)})$ are independent across mothers and have a bivariate normal distribution with zero means and $Var(u_j^{(m)}) = 1$, $Var(u_j^{(c)}) = \sigma_c^2$, and $Cov(u_j^{(m)}, u_j^{(c)}) = \sigma_{mc}$. The error $u_j^{(m)}$ has a fixed variance to ensure identifiability. Note that the siblings share the same mother-level error $u_j^{(c)}$.

2. The e-errors $(e_j^{(m)}, e_1^{(c)}, \ldots, e_{n_j}^{(c)})$ are independent and identically distributed with standard normal distribution, so $Var(e_j^{(m)}) = Var(e_{ij}^{(c)}) = 1$ and $Cov(e_j^{(m)}, e_{ij}^{(c)}) = Cov(e_{ij}^{(c)}, e_{i'j}^{(c)}) = 0$ $(i' \neq i)$. The e-errors have a fixed variance to ensure identifiability. Note that the normal distribution of the e-errors corresponds to a *probit* model for the probabilities.

3. Every u-error is independent of any e-error.

The child equation (3.2) is a random effects probit model, since $u_j^{(c)}$ varies between mothers and $e_{ij}^{(c)}$ varies within mothers. Also the mother equation (3.1) has an error structure with two terms, but it is *not* a random effects probit model since both $u_j^{(m)}$ and $e_j^{(m)}$ vary between mothers: indeed, the mother equation could be written with a single error term $w_j^{(m)} = u_j^{(m)} + e_j^{(c)}$. Decomposing the error into two additive terms is just a trick to allow a correlation between the mother and child equations: in fact, the estimation methods for random effects models allow for correlated random effects and thus the introduction of the fictitious random effects $u_j^{(m)}$ is a simple way to fit correlated equations via standard software.[8] Systems of random effects equations have been used to deal with

[8] A minor drawback due to the use of the fictitious random effects $u_j^{(m)}$ is the change in the scale of the mother equation since $Var(w_j^{(m)}) = Var(u_j^{(m)}) + Var(e_j^{(m)}) = 1 + 1 = 2$. Thus the mother equation is a *scaled probit*, i.e. a *probit* with a scale different from 1: in this case the scale factor is equal to $\sqrt{2}$, so the regression coefficients are $\sqrt{2}$ times the coefficients of an ordinary probit. Since a scaled probit is statistically equivalent to an ordinary probit, we divide the estimates by $\sqrt{2}$ to make them comparable to the results from an ordinary probit.

endogenous covariates in multilevel settings (Cochrane and Guilkey, 1995; Degraff et al., 1997). In such cases the outcome of an equation appears as a covariate in another equation. Here we take a different approach: our econometric model has a SUR structure (Seemingly Unrelated Regressions: e.g. Wooldridge, 2002), where the outcomes do not appear as covariates, but the equations are correlated through the error terms.

To understand the properties of our model it is essential to write down the model-implied residual variances and covariances of the utilities.[9] The residual variances of the mother equation and the child equation are, respectively,

$$\begin{aligned} Var(\tilde{y}_j^{(m)} \mid x_j) &= Var(u_j^{(m)} + Var(e_j^{(m)}) = 1 + 1 = 2 \\ Var(\tilde{y}_{ij}^{(c)} \mid x_j, z_{ij}) &= Var(u_j^{(c)}) + Var(e_{ij}^{(c)}) = \sigma_c^2 + 1 \end{aligned} \tag{3.3}$$

The residual covariances/correlations of the utilities for any two siblings are

$$\begin{aligned} Cov(\tilde{y}_{ij}^{(c)}, \tilde{y}_{i'j}^{(c)} \mid x_j, z_{ij}, z_{i'j}) = Cov(u_j^{(c)}, u_j^{(c)}) = Var(u_j^{(c)}) = \sigma_c^2 \\ Cor(\tilde{y}_{ij}^{(c)}, \tilde{y}_{i'j}^{(c)} \mid x_j, z_{ij}, z_{i'j}) = \sigma_c^2 / \sigma_c^2 + 1 \end{aligned} \tag{3.4}$$

The residual covariances/correlations of the utilities for a mother with one of her children are

$$\begin{aligned} Cov(\tilde{y}_j^{(m)}, \tilde{y}_{ij}^{(c)} \mid x_j, z_{ij}) = Cov(u_j^{(m)}, u_j^{(c)}) = \sigma_{mc} \\ Cor(\tilde{y}_j^{(m)}, \tilde{y}_{ij}^{(c)} \mid x_j, z_{ij}) = \sigma_{mc} / \sqrt{2(\sigma_c^2 + 1)} \end{aligned} \tag{3.5}$$

The interpretation of the variance-covariance parameters σ_c^2 and σ_{mc} is easier if they are transformed into correlations, namely the correlation of utilities among siblings (3.4) and the mother-child correlation (3.5). Note that any other correlation among utilities is null (e.g. among two mothers or among two children of different mothers). The random effects of the child equation $u_j^{(c)}$ summarize the effects of unobserved covariates at the mother-level on the decision to send each of her child to school. The larger their variance σ_c^2, the greater the influence of the mother's unobserved covariates on her utility of sending each child to school and thus the higher the correlation among siblings, also called Intraclass Correlation Coefficient (ICC), which is strictly positive unless $\sigma_c^2 = 0$. The mother-child correlation (3.5) can be positive or negative depending on σ_{mc}: a positive (negative) correlation means that mothers with a higher utility for working due to their unobservables $u_j^{(m)}$ (e.g. motivation or tastes for leisure) tend to have a higher (lower) utility for sending their children to school due to their unobservables $u_j^{(c)}$. As for the effects of the covariates, note that each slope has the usual interpretation in terms of change in the *probit* due to a unit increase in the corresponding covariate; however, the child equation (3.2) has random effects, so

[9] The term "residual", which means "after adjusting for the covariates", is written explicitly in the following definitions, but it is left implicit later on.

the slopes have a conditional meaning, i.e. they refer to the effect of the covariates *conditional* on the random effects $u_j^{(c)}$. Also note that the mother-level covariates x_j have an effect $\beta^{(m)}$ on the probability of working and a different effect $\beta^{(c)}$ on the probability of sending children to school.

To compute predicted probabilities we define a baseline mother and a baseline child by choosing a value for each covariate, $x_j = x_*$ and $z_{ij} = z_*$. The definition of the baseline mother also requires the specification of the value of the u-errors (unobserved covariates), which we set to their mean, i.e. $u_j^{(m)} = 0$ and $u_j^{(c)} = 0$. Denoting with $\Phi(\cdot)$ the normal distribution function, the predicted probability that the baseline mother works is $\Phi(\alpha^{(m)} + \beta^{(m)} x_*)$, while the predicted probability that the baseline child of the baseline mother attends school is $\Phi(\alpha^{(c)} + \beta^{(c)} x_* + \gamma^{(c)} z_*)$.

4 Data and variables

We draw our data from the National Family Health Survey (NFHS-2) 1998-1999, India (International Institute for Population Sciences and ORC Macro, 2000). The NFHS-2 is a household survey with two distinct samples: a sample of around 92,500 households, who answered the Household Questionnaire, and a sample of around 90,300 married women aged 15-49 who are members of the household sample and who answered the Woman's Questionnaire. The sample covers more than 99 per cent of India's population living in all 26 Indian states. For each state, urban and rural areas were sampled separately, with sample sizes proportional to the corresponding population sizes. Our analysis is based on two samples: a sample for urban areas made up of 14,181 mothers and their 26,269 children and a sample for rural areas of 33,137 mothers and their 65,726 children.

We focus on compulsory school-age children, namely children aged 6 to 14.[10] They are classified either as *students* or as *non-students.* The category of *students* includes not only full-time students, but also children who study and work either for the market (a very small proportion, 0.26 per cent of all students) or for the family business (whose number cannot be computed from the survey, due to the structure of the questionnaire). The category of *non-students* includes those children who do not attend school at all, being employed full-time either outside (3 per cent) or for the family business (3.3 per cent) or being inactive (12 per cent). Inactivity encompasses children who are neither working nor attending school, but who may be doing some work, most likely domestic. Mothers are classified as *working* or *not-working*. According to the questionnaire, a mother is classified as working if she has done, in the last twelve months, any work either for her family's farm or business, or as self-employed, or for someone else. Mothers' employment is heterogeneous across geographical areas, with a substantial higher employment rate in rural with respect to urban areas (46 per cent versus 29 per cent). The mothers' employment rate and the percentage of children in each activity status are shown in Table 1.

[10] In accordance with the principle contained in the Constitution, the Government has to provide free and compulsory education for all children aged 6 – 14 years. Primary education (or the elementary stage) caters to children aged 6 – 14 that is our children's reference age group. In all States, elementary education is composed of two cycles: primary education and middle school (or upper primary) (World Data on Education, 2007).

Table 1: Employment rate (per cent) of mothers aged 15-49 and activity status (per cent)of children aged 6-14

	Mother	Children			
Area	Working	Student	Work for the family	Work for the market	Inactive
Rural	46	79	4	3	14
Urban	29	90	1	2	7
All India	*41*	*82*	*3*	*3*	*12*

Source: National Family Health Survey (NFHS-2) 1998-1999

Table 2 takes into account the multilevel structure of the data and the fact that each mother might have more than one child, each one either studying or not. The table shows that, both in urban and rural areas, it is more likely for working mothers that none of their children is attending school than for non working mothers. The case in which only a fraction of all children aged 6-14 in the household is studying is also more represented among working mothers, whereas non working mothers are more likely to have all their children attending school. This represents a preliminary descriptive evidence of the existence of a negative correlation between mothers' employment and children's schooling without accounting for any other influence. This relation is tested using the econometric model described in Section 3 controlling for the influence of the observable covariates and making some assumptions on the unobservable covariates.

Table 2: Ratio of children studying on the total number of children of 6-14 years old in the household by the mother's employment status and area

	Student-Children ratio			
Mother's status	zero	0-0.5	0.5-1	1
		Urban		
Working	7.87	1.72	4.23	86.19
Not working	3.85	0.90	3.14	92.11
All Mothers	4.98	1.13	3.45	90.44
		Rural		
Working	16.75	4.07	8.50	70.68
Not working	9.28	2.35	6.70	81.67
All Mothers	12.68	3.13	7.52	76.67

Source: National Family Health Survey (NFHS-2) 1998-1999

In our application the child-level covariates z_{ij} and the mother-level covariates x_j are selected using two steps. Firstly, covariates are chosen on the basis of theoretical considerations, findings in the literature, and availability in the dataset. Secondly, given the need to estimate a parsimonious specification because of the computational burden of the multilevel technique, only variables that were statistically significant in preliminary estimations are kept for the final multilevel model specification[11]. As a result, the child-level covariates z_{ij} for the child equation (3.2) are age and gender,

[11] Variables excluded are fathers' education and the presence of schools in the villages (this information is available only for rural areas). Fathers' education is probably not statistically significant due to the inclusion in the model of fathers' occupations that may also capture the education effect. The unexpected insignificance of the presence of primary schools in the villages may be explained by the presence of primary schools in almost all villages (more than

while the mother-level covariates x_j for the mother equation (3.1) and for the child equation (3.2) include the number of members of the household (disaggregated by age group and distinguished between siblings and other children), mother's education and age, religion of the household head and household in scheduled caste or tribe, partner's occupation, household wealth, acres of land owned by the household, and five dummy variables for geographical areas. Children's age and gender are standard covariates in the studies of children's schooling (see for example Cigno and Rosati, 2005). Turning to mothers' covariates it is well known in the literature that the presence of children in the household can affect mothers' time allocation and work preferences. The presence of young children can also affect the allocation of time of older children who often, particularly if female, have to take care of them. Moreover, in developing countries where enlarged families are quite common, it is also important to control for the presence of children who are not the own children of the observed mother, since they might represent a potential increase in child care tasks for all members (especially female) in the household. Mother's age enables the control for different participation rates of women over the life-cycle. As far as education is concerned, a huge amount of evidence for developed countries documents the fundamental role of education for women's employment and empowerment (Boeri et al., 2005). Other studies have stressed the important role, in Asian societies, of mothers' education in improving their children's education (Behrman et al., 1999), health and survival (among others, Dreze and Murthi, 1999). Any study on India has to include controls for the households' caste or tribe. Low-caste households and tribal minorities suffer disproportionately from poverty and discrimination, even if after independence the untouchables have been abolished as a caste by the Constitution with norms that protect Scheduled Castes (SC) and Scheduled Tribes (ST). However, (Kijima, 2006) shows that SC and ST are much poorer than non-SC/ST, and this is partly due to geographical differences (especially for ST that live in the most unreachable areas of the country) and partly to the fact that they are still disadvantaged in obtaining well paid jobs. Another fundamental control concerns the household's State of residence. India is a huge country with enormous differences between States. However, given the need to estimate a parsimonious specification we have grouped the States in five geographical areas, the same as those used in the NFHS-2 country report.[12]

Since poverty is one of the most important factors driving family decisions (see discussion in Section 2), family income and wealth variables play a crucial role in determining mothers' and children's activities. Unfortunately the NFHS-2 survey neither provides information on household income nor on earnings,[13] thus labour income is proxied by mothers'education and by the skill level of fathers' occupations. However, income and earnings data from other surveys for India (and also for other countries) are generally not very reliable or present strong limitations.[14] Moreover, wages are usually endogenous in any analysis and would require appropriate variables for

90 per cent of children have a primary school in their village).

[12]We have anyway experimented with separate probit models for children's school attendance and mothers' employment and found that the results do not change significantly when introducing dummies for all States, or using the five dummies for geographical areas.

[13]the implications of the omission of these variables for our results are carefully discussed in Section 5.

[14]Degraff and Levison (2009), for example, assert that income is generally not considered to be reliably measured in the PNAD for Brazil and prefer to construct a linear index for wealth.

identification. To control for wealth we use the NFHS-2 wealth index based on information on family assets.[15] In addition, since the property of a family farm can also affect women's and children's allocation of time (see discussion in Section 2), we use the information on acres of land owned by the household, which is available in the data, as a proxy for it.

Table 3: Mean values of mother-level covariates by mothers' activity status (mothers'sample)

	Urban(n=14181)		Rural (n=33137)	
Mother-level covariates	Working	Not-Working	Working	Not-Working
Number of children aged 0 - 5	0.425	0.566	0.721	0.804
Number of children aged 6 - 14	1.868	1.853	1.999	1.988
Children aged 0 - 5 of other mothers	0.101	0.124	0.137	0.172
Number of household members over 14	2.539	2.906	2.603	3.055
Mother is literate	0.626	0.716	0.257	0.408
Years of mother's education	5.850	6.239	1.545	2.663
Mother's age	35.011	33.668	33.28	33.055
Head of hh is Muslim	0.118	0.181	0.075	0.151
Head of hh is Christian	0.105	0.046	0.074	0.036
Head of hh in scheduled caste or tribe	0.298	0.184	0.423	0.258
Household wealth index	0.587	0.938	-0.606	-0.288
Acres of land owned by the hh	1.004	1.728	0.888	1.001
Partner's job: clerical or professional	0.216	0.231	0.099	0.09
Partner's job: sales	0.119	0.207	0.039	0.087
Partner's job: skilled manual	0.251	0.318	0.342	0.186
North	0.234	0.300	0.172	0.260
Central	0.125	0.146	0.216	0.202
East	0.093	0.135	0.147	0.248
Northwest	0.140	0.084	0.131	0.147
West	0.203	0.169	0.122	0.041
Observations	*4076*	*10105*	*15302*	*17755*

Source: National Family Health Survey (NFHS-2) 1998-1999

Table 3 shows the means for the mother-level covariates x_j in the mothers' sample by mothers'employment status in urban and rural areas. Both in rural and urban areas mothers who do not work are more likely to belong to households with a higher number of young children (both own children or children of other mothers) and a higher number of household members over 14. In contrast, only a slightly lower number of children aged 6-14 is observed for non working mothers. The former evidence suggests that the mothers are committed to child care and the presence in the family of a very small child (even if not their own child) may represent a barrier to working. On the other hand, a higher number of older children in the household probably reduces the mothers' family constraints since they can help in looking after siblings or performing household chores. The latter evidence may reflect a substitution between hours spent in domestic chores by mothers and hours spent in the market. Compared to non-working mothers, working mothers are slightly

[15]The wealth index takes into account almost all household assets and utility services. The principal components analysis is used to assign the indicator weights. This procedure first standardizes the indicator variables (calculating z-scores) and then calculates the factor coefficient scores (factor loadings). Finally, for each household, the indicator values are multiplied by the loadings and added to produce the household's index value. In this process, only the first of the factors produced is used to represent the wealth index. The resulting sum is itself a standardized score with a mean of zero and a standard deviation of one (Filmer and Lant, 2001).

older, less likely to be literate (63 per cent versus 72 per cent in urban areas and 26 per cent versus 41 per cent in rural areas) and the literate have achieved a lower level of education (5.8 years versus 6.2 years in urban areas and 1.5 years and 2.7 years in rural areas). A working mother is less likely to belong to a Muslim household and more likely to belong to a Christian household or to a household in a scheduled caste or tribe. According to the wealth index provided in (NFHS-2), working mothers live in poorer households and own less land than non-working mothers. Their partners are more likely to be unemployed or (unskilled and skilled) manual workers rather than professional, clerical or sales workers than partners of non-working women. Employed mothers are more concentrated in the urban areas of the Northwest and of the West of India, and in the rural areas of Central and West India.

Table 4: Mean values of mother-level and child-level covariates by children's activity status (children's sample)

	Urban(n=26269)		Rural (n=65726)	
Mother-level covariates	Studying	Not-Studying	Studying	Not-studying
Child's age	9.908	10.523	9.642	10.112
Child is male	0.525	0.469	0.551	0.390
Number of children aged 0 - 5	0.479	0.801	0.701	0.945
Number of children aged 6 - 14	2.277	2.744	2.433	2.677
Children aged 0 - 5 of other mothers	0.112	0.112	0.147	0.136
Number of household members over 14	2.743	2.541	2.832	2.439
Mother is literate	0.307	0.784	0.625	0.923
Years of mother's education	5.955	1.200	2.339	0.352
Mother's age	34.051	34.192	33.321	33.995
Head of hh is Muslim	0.175	0.359	0.116	0.172
Head of hh is Christian	0.068	0.020	0.061	0.026
Head of hh in scheduled caste or tribe	0.225	0.296	0.321	0.428
Household wealth index	0.852	-0.099	-0.354	-0.892
Acres of land owned by the hh	1.586	0.373	1.042	0.672
Partner's job: clerical or professional	0.224	0.052	0.090	0.018
Partner's job: sales	0.184	0.134	0.072	0.046
Partner's job: skilled manual	0.308	0.356	0.170	0.139
North	0.289	0.238	0.240	0.180
Central	0.149	0.224	0.209	0.253
East	0.110	0.204	0.177	0.296
Northwest	0.108	0.056	0.154	0.097
West	0.176	0.140	0.079	0.062
Observations	*23863*	*2406*	*52221*	*13505*

Source: National Family Health Survey (NFHS-2) 1998-1999

Table 4 compares the means of mother-level and child-level covariates in the children's sample for student and non-student children by urban and rural areas. Looking at children's own characteristics, it shows that student children are younger than non-student children and are more likely to be male than female. This evidence is common to both urban and rural areas. Turning to mothers' characteristics both in urban and in rural areas student children belong to households with a lower number of children aged 0-5 and 6-14, but a higher number of people older than 14. They have a higher probability of having a literate mother (69 per cent versus 22 per cent in urban areas and 38 per cent versus 7.7 per cent in rural areas) with a higher number of years of education (6 years versus 1.2 years in urban areas and 2.3 years versus 0.3 years in rural areas). In contrast, mothers'

age is almost the same for student and non-student children, both in urban and rural areas. Student children are less likely to be in a Muslim and scheduled caste or tribe household and more likely to be in a Christian family. They are also more likely to live in richer households with more acres of land owned than non-student children. Their father is more likely to be a clerical, professional or sales worker than a manual worker or an unemployed person. Children are more likely to attend school in the urban Northwest and West parts of India and in the rural North, Northwest and West parts of India.

5 Results

The model presented in Section 3 has been fitted with maximum likelihood.[16] This section first presents the results of the child equation, then the results of the mother equation and finally discusses the estimated correlation among siblings and the mother-child correlation. The predicted probabilities that a child attends school and a mother works are computed using the following definitions of baseline child and baseline mother: (i) the baseline child is a girl aged 13; (ii) the baseline mother is aged 34, illiterate, with two children aged 6 to 14 and no child aged 0 to 5, her partner is unemployed or unskilled. The household she lives in is the South, is composed of a single family, the head is Hindu, the family does not own land and the wealth is at the first quartile of the area (0.1902 for urban area and -1.0224 for rural area). Moreover, the baseline mother has a mean value on the unobserved covariates, namely $u_j^{(m)} = u_j^{(c)} = 0$.

5.1 The child equation

The maximum likelihood estimates of the child equation 3.2 are presented in Table 5.[17] For each area, the first column reports the estimate of the slope, while the second column reports the predicted probability for a hypothetical subject differing from the baseline for a unit increase in the covariate under consideration. For example, the heading of the second column of the urban area informs us that in urban areas the baseline child of a baseline mother has a predicted probability of 94.6 per cent of attending school, while the value corresponding to the covariate *Child is male* informs us that, if the baseline is modified by "switching sex" from female to male, then the predicted probability becomes 96.8 per cent. For numerical covariates a unit increase from the baseline is considered and when a quadratic term is present the predicted probability is reported only in the row corresponding to the quadratic term: for example, 84.7 per cent is the predicted probability

[16] Fitting the joint model with the mother equation and the child equation is computationally heavy, so to select the best model specification the two equations were first fitted separately. Then the two equations have been fitted simultaneously in order to estimate the covariance σ_{mc} and thus derive the mother-child correlation.

[17] The model has two levels (mother level and child level) even if the phenomenon has further levels above the mother, such as the household and the region levels. Including random effects for higher levels is conceptually simple, but computationally prohibitive. To check that neglecting higher levels is not harmful, we fitted the two-level model and computed robust standard errors with households as top-level clusters (Skrondal and Rabe-Hesketh, 2004). This is a way to assess how the standard errors are influenced by the correlation among children of different mothers living in the same household. Since the robust standard errors are only slightly bigger than the classical ones, the two-level specification seems to suffice.

of attending school obtained if *Child's age* is changed from 13 to 14 taking into account both the linear and the quadratic effect.

Table 5: Estimated random effect probit that the child attends school - Child equation of the joint multilevel model

	Urban			Rural		
Covariate	Coefficients	SE	Prob. (base=94.6%)	Coefficients	SE	Prob. (base=56.2%)
Child's age: linear	1.199**	0.068		0.989**	0.031	
Child's age: quadratic	-0.066**	0.003	84.7%	-0.055**	0.002	36.7%
Child is male	0.247**	0.041	96.8%	0.749**	0.020	81.7%
Number of siblings aged 0 – 5: linear	-0.322**	0.083		-0.274**	0.037	
Number of siblings aged 0 - 5: quadratic	0.030	0.030	90.6%	0.027*	0.013	46.4%
Number of siblings aged 6 - 14: linear	0.056	0.101		0.096*	0.047	
Number of siblings aged 6 - 14: quadratic	-0.038*	0.018	93.0%	-0.037**	0.009	52.7%
Children aged 0-5 of other mothers	-0.175	0.099	92.4%	-0.243**	0.041	46.5%
Number of household members over 14	0.011	0.016	94.7%	0.041**	0.007	57.8%
Mother is literate	0.486**	0.107		0.751**	0.069	
Years of mother's education†	0.062**	0.015	99.2%	0.054**	0.012	89.1%
Mother's age	-0.012*	0.005	94.5%	-0.018**	0.002	55.5%
Head of household is: Muslim	-0.607**	0.068	84.1%	-0.575**	0.038	3.8%
Head of household is: Christian	0.153	0.162	96.1%	0.243**	0.070	65.5%
Head of household in scheduled caste or tribe	-0.104	0.066	93.4%	-0.275**	0.027	45.3%
Household wealth index: linear	1.057**	0.055		0.958**	0.035	
Household wealth index: quadratic	-0.107**	0.036	99.4%	-0.260**	0.028	91.7%
Acres of land owned by the household: linear	0.590**	0.123		-0.046**	0.015	
Acres of land owned by the household: quadratic	-0.006**	0.001	98.6%	0.000**	0.000	54.4%
Partner's job: clerical or professional	0.602**	0.105	98.6%	0.578**	0.069	76.8%
Partner's job: sales	0.246**	0.084	96.8%	0.156**	0.055	62.2%
Partner's job: skilled manual	0.145*	0.063	96.0%	0.099**	0.035	60.1%
Region: North	-0.300**	0.091	90.4%	0.048	0.044	58.1%
Region: Central	-0.211*	0.094	91.9%	0.065	0.042	58.7%
Region: East	-0.221*	0.096	91.7%	-0.104*	0.042	52.1%
Region: Northwest	0.337**	0.127	97.4%	0.345**	0.051	69.2%
Region: West	-0.145	0.095	92.8%	-0.047	0.056	54.3%
Constant	-2.575**	0.379		-1.587**	0.166	
$\hat{\sigma}_c$	1.445**	0.035		1.260**	0.018	
Intraclass Correlation Coefficient	0.676**	0.011		0.614**	0.007	
$u_j^{(c)}$ at 10*th* percentile ($u_j^{(c)} = -1.282\hat{\sigma}_c$)	-1.852		40.3%	-1.615		7.2%
$u_j^{(c)}$ at 25*th* percentile ($u_j^{(c)} = -0.674\hat{\sigma}_c$)	-0.975		73.6%	-0.850		24.4%
$u_j^{(c)}$ at 75*th* percentile ($u_j^{(c)} = +0.674\hat{\sigma}_c$)	0.975		99.5%	0.850		84.3%
$u_j^{(c)}$ at 90*th* percentile ($u_j^{(c)} = +1.282\hat{\sigma}_c$)	1.852		100.0%	1.615		96.2%

** Significant at the 1% level. *Significant at the 5% level. †Literate mother with 5 years of education.
Source: National Family Health Survey (NFHS-2) 1998-1999

Our findings are broadly consistent with the recent literature on school participation in India (see for example, Dostie and Jayaraman, 2006; Kambhampati, 2009). Starting with child-level covariates, we find that the child's age has a significant quadratic effect and males have a higher probability of studying. To appreciate the role of age and gender it is important to see how they affect the predicted probability of attending school, keeping all the mother-level covariates at the baseline value, as in Figure 1. The probabilities are very high and almost constant for ages 7 to 10 in urban areas whereas in rural areas they are much lower. The lower values at age 6 are likely to be due to delayed entry or imperfections in age recording, while the decay starting at age 11 reflects school drop-out. The gender gap is modest in urban areas and relevant in rural areas, espe-

cially for ages 12 to 14. This is in line with previous findings on gender gaps in school attendance in developing countries (Kingdon, 1998, 2002). The household structure has an important role for the probability of studying. Larger numbers of siblings aged 0 to 5 are associated with lower probabilities of attending school, even if the quadratic term implies a decreasing marginal effect of additional siblings.

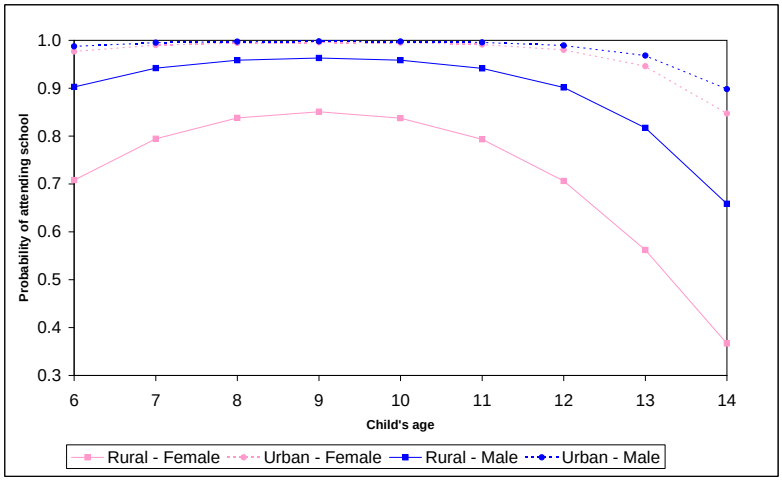

Figure 1: Predicted probability of attending school on child's age, by area and gender.

Source: National Family Health Survey (NFHS-2) 1998-1999

This effect is similar in urban and rural areas, with a slightly larger value in the former. On the contrary, the other aspects of household composition are markedly different in the two areas. The number of siblings aged 6 to 14, the presence of children of other mothers in the household and the number of all other members over 14 do not have significant effects in urban areas, whereas in rural areas these effects are significant. In particular, in rural areas, siblings aged 6 to 14 reduce the probability of studying by a small amount (but the quadratic term implies a decreasing marginal effect of additional siblings), the presence of children aged 0 to 5 of other mothers reduces the probability by the same amount of siblings of the same age, whereas the presence of other members in the household helps to improve the child's chances of going to school. These results suggest that in rural areas there is a sort of "pooling effect" of members of different families in the same household. For example, the number of all small co-resident children reduces the probability of schooling of any school-age child present in the household, as if a small child absorbed time and income resources of the household as a whole irrespective of their own mother. In the same line of interpretation, any adult member may contribute by offering time and income to the household, thus securing better conditions for school-age children. This "pooling effect" is less likely in urban

areas, where the provision of services for the family may be external to the household.

The effect of the mother's education is modelled through a dummy variable (*Mother is literate*) and a numeric variable (*Years of mother's education*): since switching the dummy while keeping the numeric at zero is meaningless, the predicted probability for *Mother is literate* is not reported, while the predicted probability for *Years of mother's education* is computed for a literate mother with 5 years of education. Mother's education has a crucial role, mostly in rural areas. An illiterate mother is detrimental for the schooling chances of her children and the higher the number of years of education of the mother, the higher the probability that her children attend school, thus confirming a well established result in the literature. The mother's age has a small negative effect, which we attribute to a cohort effect. As for household characteristics, the religion of the head is relevant: compared to Hindu, the probability of attending school is lower for Muslim and higher for Christian. Also being in a scheduled caste or tribe proves to be negative for children's opportunities, especially in rural areas. Household wealth is a very strong predictor that affects the probability of schooling in a quadratic way. In both areas the marginal effect on the probability is positive and decreasing, so a given difference in wealth is very important for poor families and negligible for rich families. Figure 2 shows the plot of the predicted probability of attending school against values of the wealth index in the observed range, when the other covariates are at baseline values. Children's schooling is strongly influenced by wealth. The curves for urban and rural areas are very close: therefore, all things being equal (in particular wealth), the chance of attending school is similar in the two areas. However, the distribution of wealth is markedly different in the two areas, as pointed out by the median value highlighted in the picture: this fact explains the large gap in the sample proportions of children attending school in urban and rural areas.

Acres of land owned by the household have an opposite effect in urban and rural areas. In urban areas they capture a pure wealth effect, that is, land ownership increases the child's probability of schooling. In rural areas the effect is peculiar: a few acres of land property decreases the probability of schooling, since children are expected to engage in the family agricultural activities, but as the number of acres of land owned rises, the effect tends to become a pure wealth effect, thus increasing the probability of studying (the fitted parabola has a minimum at 23 acres). This result is consistent with the theoretical and empirical evidence of an inverted-U relationship between land holdings and child labour discussed in Basu et al. (2010). Turning to the professional position of the partner of the mother, we find that partners in higher positions increase the probability of children attending school, since skilled workers, salesmen and, especially, clerical/professional workers have a significant and positive effect as compared to the unskilled workers or the unemployed.

Let us now turn to discuss the role of unobserved heterogeneity.The econometric model postulates that the correlation among siblings is due to sharing the same utility-maximizing mother. Indeed, in the child equation all the children of a mother share the same mother-level error $u_j^{(c)}$. If the residual correlation between the utilities for any two children is high, it means that siblings' outcomes are strongly related, thus justifying the use of a multi-level analysis. The random effects

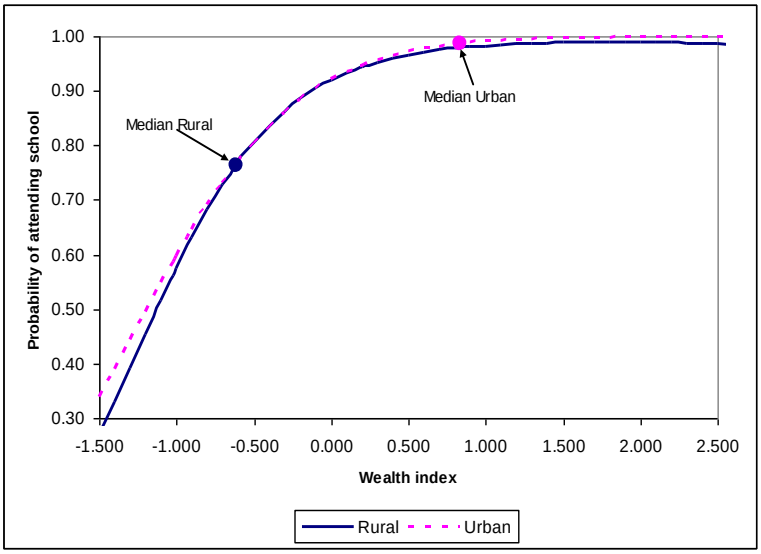

Figure 2: Predicted probability of attending school on household wealth index, by area.

Source: National Family Health Survey (NFHS-2) 1998-1999

$u_j^{(c)}$ represent unobserved factors at the mother level. Their standard deviation σ_c is estimated to be significant and very high: 1.445 in urban areas and 1.260 in rural areas. Thus an increase of one in the value of the standard deviation of the unobserved factors at mother level is associated with an increase of 1.445 and 1.260, in urban and rural areas respectively, in the probability of sending children to school. This effect is larger than any other observed covariate effect. It is instructive to consider some scenarios by computing the predicted probability of attending school for a few values of $u_j^{(c)}$: since the random effects have a normal distribution with zero mean and standard deviation σ_c, interesting values are $u_j^{(c)} = k\sigma_c$ for k taken at some percentiles of the distribution, e.g. 10th (−1.282), 25th (−0.674), 50th (0), 75th (+0.674), and 90th (+1.282). The predicted probability for $u_j^{(c)} = 0$ is just the baseline reported in the headings of Table 5, while the predicted probabilities for the other values of k are reported in the last four rows of Table 5. If the mother has a high utility for sending her children to school due to a higher value of $u_j^{(c)}$, it is almost certain that her children actually attend school (nearly 100 per cent in urban areas and 96.2 per cent in rural areas, when the covariates are at baseline values). Conversely, if the mother has a low utility for sending her children to school due to a lower value of $u_j^{(c)}$, it is unlikely that they actually attend school (40.3 per cent in urban areas and 7.2 per cent in rural areas, when the covariates are at baseline values). Therefore, in this analysis unobserved heterogeneity plays a substantial role. The standard deviation of the random effects can be converted into the ICC among the mother's utilities of sending her children to school, yielding 0.68 for urban areas and 0.61 for rural areas. The size of the correlation confirms that the mother's tendency to treat all children in the same way dominates other observed effects, like discriminating among children according to their age or sex.

In order to check if the ICC is sensitive to the household's wealth, we fitted the model on two sub-samples defined by the bottom and top deciles of the wealth index, reporting the results in Table 6.[18]

Table 6: ICC for the child equation: estimates in the full sample and in sub-samples of wealth deciles (sample size in parenthesis)

Full Sample		Bottom wealth decile		Top wealth decile	
Urban (n=26269)	Rural (n=65726)	Urban (n=4229)	Rural (n=10237)	Urban (n=2845)	Rural (n=9206)
0.68**	0.61**	0.66**	0.62**	NA+	0.32

** Significant at the 1% level. +Estimation algorithm did not converge.
Source: National Family Health Survey (NFHS-2) 1998-1999

Interestingly, the ICCs of the bottom deciles are nearly the same as those in the full sample, whereas in the top deciles they drop sharply. This might indicate that a higher wealth gives the mothers more freedom to choose the schooling status according to the child's observed characteristics. In fact, the ICC of the top decile in rural areas shows the lowest value and it is not significant, while in urban areas it could not even be estimated due to a very low variation in the outcome (nearly all children attend school).

5.2 The mother equation

Maximum likelihood estimates of the mother equation 3.1 are presented in Table 7. The child-level covariates are obviously not usable. We tried all the mother-level covariates considered for the child equation, but we found fewer significant effects, so the final specification is simpler. Our results are broadly consistent with the recent literature on women's participation in India (see Olsen and Mehta, 2006).

Own children aged 0 to 5 reduce the probability of working in both areas, but more in urban ones. Own children aged 6 to 14 and children of other mothers present in the household do not have significant effects, thus they are excluded from the final specification. The number of members aged 14 and over has a negative effect, as if their work would substitute for that of mothers.

Literate mothers have a lower probability of working in rural and urban areas. Moreover, the years of education are statistically significant only in urban areas. On the contrary, in urban areas the effect depends on the years of education: compared with illiterate mothers, the probability of working is lower for mothers with few years of education and higher for mothers with several

[18]The sample sizes reported in the table are numbers of children, while the selection of the sub-samples is based on a mother-level covariate, so the decile sub-samples need not be one tenth of the full sample. Indeed, both sub-samples are larger than one tenth of the full sample, since the mothers in the poorest and richest households tend to have more children.

Table 7: Estimated employment probability of mothers. Mother-equation of the joint multilevel model

Covariates	Urban			Rural		
	Coefficients	SE	Prob. (base=51.3%)	Coefficients	SE	Prob. (base= 81.5%)
Number of children aged 0 – 5	-0.150**	0.018	45.3%	-0.107**	0.009	78.6%
Number of household members over 14	-0.025**	0.006	50.3%	-0.023**	0.004	80.9%
Mother is literate	-0.541**	0.044		-0.331**	0.032	
Years of mother's education†	0.070**	0.005	43.7%	0.002	0.005	71.8%
Mother's age	0.020**	0.002	52.1%	0.000	0.001	81.5%
Head of household is: Muslim	-0.149**	0.036	45.4%	-0.246**	0.024	74.3%
Head of household is: Christian	0.368**	0.052	65.6%	0.495**	0.037	91.8%
Head of household in scheduled caste or tribe	0.152**	0.031	57.3%	0.305**	0.017	88.6%
Household wealth index: linear	-0.535**	0.026		-0.376**	0.015	
Household wealth index: quadratic	0.090**	0.013	35.3%	0.086**	0.012	66.7%
Acres of land owned by the household: linear	-0.020	0.022		0.063**	0.008	
Acres of land owned by the household: quadratic	0.000	0.000	50.5%	-0.001**	0.000	83.2%
Partner's job: clerical or professional	-0.254**	0.036	41.2%	-0.099**	0.031	78.8%
Partner's job: sales	-0.415**	0.037	35.1%	-0.234**	0.032	74.7%
Partner's job: skilled manual	-0.328**	0.030	38.4%	-0.137**	0.021	77.7%
Region: North	-0.044	0.038	49.5%	-0.669**	0.026	59.1%
Region: Central	-0.149**	0.043	45.4%	-0.613**	0.026	61.2%
Region: East	-0.441**	0.046	34.1%	-1.072**	0.027	43.1%
Region: Northwest	0.019	0.048	52.0%	-0.722**	0.029	57.0%
Region: West	0.137**	0.039	56.7%	0.266**	0.034	87.8%
Constant	-0.640**	0.090		0.424**	0.052	

** Significant at the 1% level. *Significant at the 5% level. †Literate mother with 5 years of education
Source: National Family Health Survey (NFHS-2) 1998-1999

years of education (for the baseline mother, who is illiterate, the predicted probability of working is 51.3%, that becomes 43.7% at 5 years of education, 46.5% at 6 years, 52.0% at 8 years, 57.6% at 10 years). This pattern is well represented in Figure 3, which shows the predicted probability of mothers' employment on years of mothers' education.This probability drops sharply from illiteracy to literacy in both areas, but in rural areas it starts from a much higher value. It then remains constant, irrespective of years of education, in rural areas - additional years of education are not statistically significant - whereas in urban areas it rises constantly with years of education. Interestingly, even for high levels of education the probability of being employed in rural areas is larger than in urban areas (up to 16 years of education). As shown also in other studies (see for example Francavilla and Giannelli, 2010), these results may reflect the problem of poor job opportunities for women. The majority of occupations held by women are generally low paid and unskilled, so that only women in a severe state of necessity would accept them. In this light, it is easier to understand the negative association between work and literacy. On the other hand, in urban areas job opportunities for women are more likely to include higher quality jobs, so that education recovers its role in improving women's autonomy through market work. Age has a positive effect, even if it is significant only in urban areas. Moreover, differences due to religion and caste/tribe are notable, especially in rural areas.

As for the wealth effects, the coefficients on a quadratic specification of the wealth index show that wealthier mothers have a lower probability of working. This effect is represented in Figure 4 which shows the probability of mothers' employment on the household wealth index. The figure shows

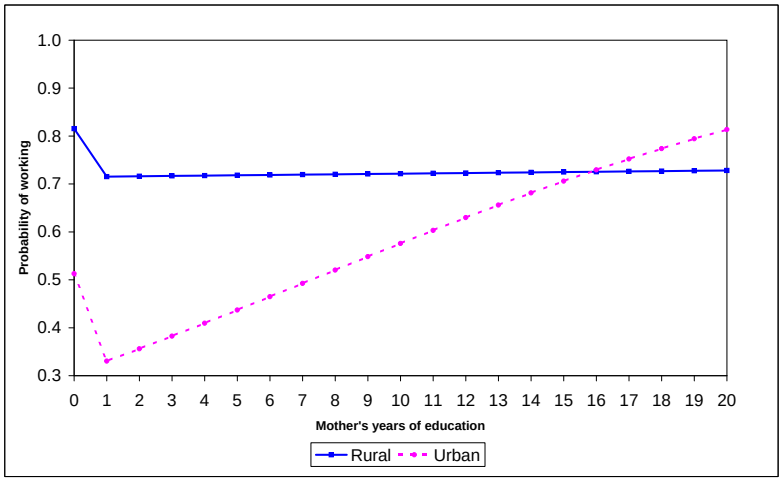

Figure 3: Predicted probability of mothers' employment on mothers' years of education, by rural and urban areas.

Source: National Family Health Survey (NFHS-2) 1998-1999

that the effect is opposite to the one found for children's schooling (see Figure 2), which tended to increase with wealth. The gap in the employment probability between urban and rural areas tends to increase with wealth. Property of land has a significant effect only in rural areas, where the probability of working increases up to nearly 50 acres of land, and then declines. The partner's professional position, approximating mother's non-labour income, has a sound role, especially in urban areas. The position of salesmen seems to have the largest disincentive effect on women's work.

5.3 The correlation among child and mother equations

The simultaneous model defined in Section 3 allows us to estimate the covariance σ_{mc} between the u-errors of the two equations and thus to test more properly the mother-child correlation due to unobservables. In urban areas the covariance σ_{mc} is significant and estimated as -0.2805, yielding a residual correlation of -0.11 between the utilities for working and sending children to school, after controlling for the observed covariates. The relationship is slightly stronger in rural areas, with a significant covariance of -0.3948 and a mother-child residual correlation of -0.18. The presence of a significant mother-child correlation supports the interdependence hypothesis and the consequent choice of a joint model. Moreover, the mother-child correlation is negative (that is, if the mother works the child is less likely to attend school), thus confirming the previous evidence

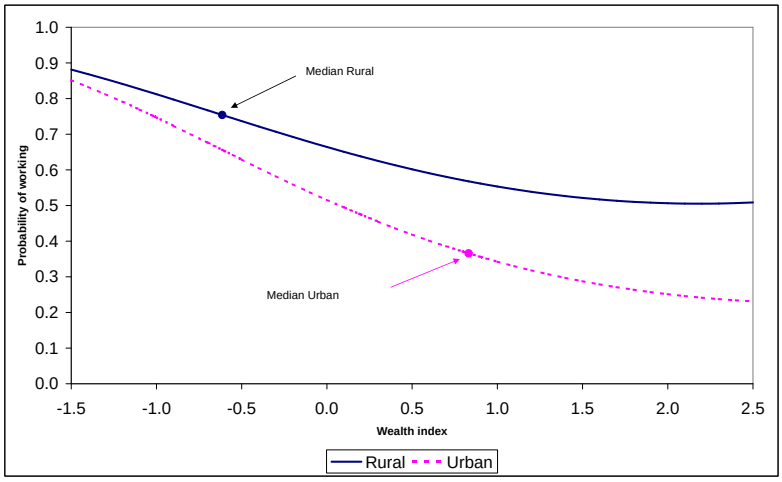

Figure 4: Predicted probability of mothers' employment on household wealth index, by urban and rural areas.

Source: National Family Health Survey (NFHS-2) 1998-1999

on the complementarity between maternal work and child labour and between maternal work and child "inactivity" (Francavilla and Giannelli, 2010). At first sight, the estimated mother-child correlation seems modest in both areas. However, such a correlation is what remains after controlling for the covariates. Moreover, it concerns the latent utilities rather than the observed outcomes: indeed, the impact of the estimated correlation on the observed outcomes is substantial.

Table 8 helps in clarifying this point. Note that the bivariate normal distribution of the u-errors in model (3.1)-(3.2) implies $E(u_j^{(c)} \mid u_j^{(m)}) = \sigma_{mc} u_j^{(m)}$. For example, if a mother in a rural area ($\hat{\sigma}_{mc} = -0.395$) has a high "propensity"[19] to work, specifically if she is at the third quartile of the unobserved factors determining the working status (i.e. $u_j^{(m)} = 0.674$ since it has a standard normal distribution), then the mean value of the unobserved factors determining the schooling status of one of her children is not $E(u_j^{(c)}) = 0$ but $E(u_j^{(c)} \mid u_j^{(m)}) = -0.395 \times 0.674 = -0.266$. Such a shift makes the predicted probability for the baseline child decrease from 56.2 per cent to 45.6 per cent. Taking the 90th percentile ($u_j^{(m)} = 1.282$) the predicted probability goes down to 36.3 per cent.

As already emerged, both outcomes are strongly related to the level of household wealth. We therefore expect the magnitude of this negative correlation to depend on the distribution of wealth. In richer households, for example, where parental choices are likely to be less driven by neces-

[19]Note that the word "propensity" does not refer to preferences. It refers to all unobserved components, which may include preferences among other variables, that may influence a mother's choice to work (like, for example, her and her children's health status).

Table 8: Child probability of attending school for different values of mothers' unobservables - baseline child and baseline mother

	Urban	Rural
$u_j^{(m)}$ at $10th$ percentile $E(u_j^{(c)} \mid u_j^{(m)}) = -1.282\hat{\sigma}_{mc}$	97.5%	74.6%
$u_j^{(m)}$ at $25th$ percentile $E(u_j^{(c)} \mid u_j^{(m)}) = -0.674\hat{\sigma}_{mc}$	96.4%	66.4%
$u_j^{(m)}$ at $50th$ percentile $E(u_j^{(c)} \mid u_j^{(m)}) = 0$	94.6%	56.2%
$u_j^{(m)}$ at $75th$ percentile $E(u_j^{(c)} \mid u_j^{(m)}) = +0.674\hat{\sigma}_{mc}$	92.2%	45.6%
$u_j^{(m)}$ at $90th$ percentile $E(u_j^{(c)} \mid u_j^{(m)}) = +1.282\hat{\sigma}_{mc}$	89.4%	36.3%
$\hat{\sigma}_{mc}$	-0.280	-0.395
Estimated correlation between unobservables	-0.114	-0.185

Source: National Family Health Survey (NFHS-2) 1998-1999

sity, the negative correlation between mothers' employment and child schooling might disappear because the probability that children attend school is almost one (see Figure 2). To check this assumption, analogously to what we did for the ICC, we fitted the model on the two sub-samples defined by the bottom and top deciles of the wealth index (see Table 9).

Table 9: Correlation between mother's work and child schooling: estimates in the full sample and in sub-samples of wealth deciles (sample size in parenthesis)

Full Sample		Bottom wealth decile		Top wealth decile	
Urban (n=26269)	Rural (n=65726)	Urban (n=4229)	Rural (n=10237)	Urban (n=2845)	Rural (n=9206)
-0.11**	-0.18**	-0.19**	-0.14**	NA+	-0.01

** Significant at the 1% level. +Estimation algorithm did not converge.

Source: National Family Health Survey (NFHS-2)1998-1999

This assumption is in fact supported by the evidence, since the mother-child correlation coefficients at the top wealth deciles turn out to be very small and insignificant in rural areas, and not even derivable in urban areas, where all children are very likely to go to school. At the bottom wealth decile, the coefficient becomes larger in urban areas - whereas in rural areas it decreases slightly - with respect to that derived from the full sample.

We have conducted an analogous sensitivity analysis for different levels of education of mothers, to verify if the correlation between mothers' employment and children's schooling becomes positive (or less negative) for more educated mothers. This would be a reasonable expectation if more educated mothers had access to better paid jobs, thus facilitating child schooling through an income effect. Even if we do not find econometric evidence supporting this hypothesis,[20] this assumption is suggested by some descriptive evidence. Among the 345 graduated mothers of the urban areas, 209 work (60.58 per cent). In rural areas the graduated mothers are 43, 27 of whom are working (62.79 per cent). Therefore, graduated mothers have a much higher employment rate but they are so few of them this effect cannot be captured by our econometric analysis. Interest-

[20]We have estimated the model for the sub-sample of women with eight years of education or more but the sign and size of the correlation do not vary significantly with respect to the whole sample for both urban and rural areas.

ingly, all children of graduated mothers are attending school. Thus, the econometric result might be driven by the low level of female education in India.

To conclude, note that the negative mother-child correlation is just a residual common effect which reflects unobservable attributes of the household and of the environment. Following the line of reasoning presented in Section 2, a careful interpretation of its estimated value is therefore crucial for understanding the nature of the mother-child relation. Wages and incomes, not surveyed by NHFS, are the most relevant omitted economic variables, together with individual preferences that would anyway never be observed, all of them affecting both $u_j^{(m)}$ and $u_j^{(c)}$. For example, one would expect omitted husband's earnings to be negatively correlated with maternal labour supply and positively correlated with children's schooling, thus generating a negative correlation between the two estimated equations. In fact our results approximate this effect, since, as fathers' occupational skill increases the probability that mothers' work decreases and the probability that children attend school increases. By the same line of reasoning, one could assume that, especially in a country like India, strong maternal preferences for being a housewife, all else being equal, would decrease the probability of mothers' participation and increase the probability of children's schooling, again generating a negative correlation. The negative correlation is also likely to arise because of fathers' preferences, since, given the evidence of universal male participation, it is reasonable to assume a strong labour market attachment for males, while children are very likely to be preferred in school. Thus, a positive correlation may arise *only* through maternal wages, since with higher female wages, mothers would be induced to participate and children would be more likely to be sent to school because of the income effect. A significant negative correlation, therefore, may indicate that the positive effects stemming from female wages on women's participation (through the own substitution effect) and on children's schooling (through a household income effect) are too weak to counterbalance the negative effects of all other omitted variables. In other words, female wages - if mothers can get a salaried job at all - are too low to push up women's labour market participation jointly with children's schooling.

6 Final remarks

This analysis has attempted to answer the question of whether mothers' employment and children's schooling may become two conflicting objectives in a developing country, or, in other words, if a negative correlation between mothers' employment and children's school attendance should be expected. Our findings for India show that this is indeed the case. Controlling for covariates, among which wealth is the most powerful predictor, we find that the mother-child correlation is significant and negative. That is, if mothers work, children may contribute to housework, or to household income or simply stay inactive instead of attending school. Moreover, a significant and quite large correlation within siblings of the same mother suggests that, all other things being equal, children of the same mother tend to share the same state, even if some gender differences are present - males have a higher probability of studying. Some critical remarks on the interpretation of these correlations are in order. As usual in this kind of analyses and with this type of data, unobservable heterogeneity plays a large role, and sometimes the determinants of children's time allocation may

be not cleanly identified. Most probably, these unobservable characteristics would affect whether the mother works as well.

One of the main results of the paper is that poorer families are more likely to need both mothers and children to work in order to reach subsistence levels. So, even if these covariates proxying poverty have been controlled for, they might have been approximated or at least measured with error due to data limitations.

However, a sensitivity analysis conducted by wealth deciles, has given some more foundation to our results. For example, if poor mothers work because they need money for their family to survive while wealthier mothers work for other reasons, we would expect that the relationship between mothers working and children attending school in the top wealth deciles would become insignificant, and this indeed is what we find. Moreover, in wealthier families, mothers, and parents in general, should be less constrained by necessity to choose the same destiny for all their children - work to sustain the household's income. This is what we find, since the correlation among siblings in the top wealth deciles drops sharply. This might indicate that a higher level of wealth gives mothers more freedom to choose the schooling status according to each child's characteristics. Another result to be stressed for its diversity with respect to what is found for developed countries, concerns the role of education for women's work, namely, the probability of a mother working is not monotonically related to the mother's level of education, following a V-shaped path from illiteracy to the highest levels. We expected that the sensitivity analysis conducted on the education deciles, analogous to that performed for the level of wealth, would lead to finding a decrease in the absolute value of the negative correlation between mothers working and children attending school the higher the level of education. We do not find this result, even for the comparatively higher levels of mothers' education in urban areas. This might be suggesting the existence of a peculiar relation between mothers' levels of education and mothers' earning capacity - mothers with higher levels of education seem not to be able to access better paid jobs, or simply better pay conditions and may be forced in some cases not to send their children to school to support the income of the household. These findings suggest that policies aiming at improving both women's and children's welfare should not only pursue higher levels of education, but also target improvements in women's conditions in the labour market. However, before this negative correlation enters the list of the "stylised facts" characterising developing countries, and before its causes and consequences can be understood deeply to be used for designing policies, evidence for many other countries drawn from better, hopefully longitudinal, data is needed.

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