# The work–schooling trade–off revisited: Market and domestic work of Indian children

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**Abstract**

The paper applies a simulated maximum likelihood procedure to jointly address the decisions on market work, household chores, and school attendance of Indian children, allowing also for combinations of these activities. The analysis is based on the Survey of Living Conditions (1998) of two North Indian provinces. By including domestic work in the choice set, the trade-offs between work and school of girls are much better captured. The results show that the determinants of market and domestic work significantly differ for both sexes. Additionally, the findings stress the importance of economic opportunities for both work and schooling of children.

*JEL Classification:* J22, J13, O15
*Keywords:* Child labor, schooling, India, trivariate probit

## 1 Introduction

A growing number of empirical studies have investigated the determinants of work and schooling of children in a joint framework (starting with Canagarajah and Coulombe 1997, Cartwright 1998, Grootaert 1998, Nielsen 1998). These studies acknowledge that work and schooling are close substitutes that might also be combined, and offer valuable insights on the nature of the child labor–schooling trade–off. Many of these studies concentrate on market work by children, while necessarily defining children performing domestic chores as "idle" (e.g., Maitra and Ray 2002, Pal 2004, Ganglmair 2006). However, worldwide most working children work for their family, often performing domestic chores (Edmonds and Pavcnik 2005a). Considering them as idle blurs the role of economic incentives for child work. Another path followed by empirical research

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is to treat all working children equally, irrespective of whether they are working for the market or doing household chores (e.g., Ravallion and Wodon 2000, Ersado 2005). However, if the determinants of these two types of work systematically differ, treating them as a joint category leads to spurious results. Especially for understanding the work and schooling of young girls, it is more appropriate to address market work, household chores, and schooling as separate possibilities. These inherent differences between household chores and market work are the focus of this paper.

This paper estimates a model of simultaneous choice between market work, domestic work, and school attendance for girls and boys in two North–Indian states. The analysis investigates not only the main gender specific trade-offs between different activities, but also the determinants of inactivity and the combination of multiple activities. The regressions condition the participation on individual characteristics, household income, household composition and educational attainment, costs of schooling, and proxies of cultural norms. The role of demand–side determinants of child labor is estimated using measures of land ownership, operation of family business, and labor market characteristics which are proxied by female labor market participation rates, male unemployment, and average wage levels for females. The endogeneity of household income is explicitly addressed by a two–step instrumental variables procedure. This also allows for a more explicit measurement of the incentive effects that arise from land ownership, operating a family business, or village–level workforce participation and wages.

Due to computational difficulties and data limitations, trivariate models have not yet been applied in the analysis of child labor. The only exception to this is the work of Kambhampati and Rajan (2004) who estimate a trivariate probit model for Indian girls, and conclude that country–wide differences for the work–schooling trade–off of female children are driven by differences in cultural norms within the patriarchal kinship systems. This paper differs from their work in several aspects. It concentrates on children from two North–Indian states where patriarchy is relatively strong, and compares the trade–offs between market work, domestic work, and school attendance for both sexes. This analysis explicitly allows for combinations of different activities, instead of looking only at the first major activity of each child as in Kambhampati and Rajan (2004). By instrumenting income, this paper also puts a stronger emphasis on the role of incentive effects for market and domestic work of both sexes.

The empirical analysis is based on data from the 1997/98 Survey of Living Conditions from two Northern Indian provinces, Uttar Pradesh and Bihar (World Bank LSMS). The trivariate probit models are estimated by the method of simulated maximum likelihood. The results show that the income and incentive effects of the trade–off between school and the main type of work are of relatively similar magnitudes for both Indian girls and boys. However, there is a major difference between what types of work they perform. The strongest conflicts are found between household work and

school for girls, and market work and school for boys. Thus, when considering market work only, the magnitude of income and incentive effects for girls would be under– or overestimated. The joint estimation of school attendance with market and domestic work offers new insights on the different effects that various determinants have on the two types of work. Unsurprisingly, family structure variables like the share of females or infants in the household have more significant effects on domestic chores than market work of girls, while these effects are missing for boys. Cultural norms with respect to females' role (reflected by caste variables) have a relatively large effect on girls' involvement in market work but not in domestic chores or school. Contrastingly, cultural norms are among the few relevant determinants of boys' domestic work. Other potentially incentive– and culture–related variables, like gender–specific labor market outcomes in the village, also affect market and domestic work of children differently. For instance, the workforce participation of adult females in the village clearly shifts the trade–off in favor of market work for girls, while making boys more likely to perform both market and domestic work. The study also shows that incentive effects, captured by land ownership, family business, and labor market proxies, play an important role for the work–schooling trade–off for children of both sexes. The economic incentives to work not only raise the probability of market work and/or domestic work but also seriously conflict with school attendance.

The paper is structured as follows. Section 2 offers a short review of the main determinants of the work–school trade–off of children which is followed by a stylized model on children's occupational decisions. Section 3 describes the data, introduces the dependent and explanatory variables, and discusses the main hypotheses. Estimation methods are outlined in Section 4. Discussion of the results follows in Section 5, while Section 6 concludes.

# 2 The main determinants of the work–school trade–off

## 2.1 Literature review

The seminal contribution of Basu and Van (1998) to the theoretical analysis of child labor focuses on the role of extreme poverty by postulating needs for survival as the major driving force behind child labor. Another strand of theoretical literature views child labor mainly as a result of imperfect capital markets and missing intergenerational contracts (Ranjan 2001, Baland and Robinson 2000), that lead to suboptimal investment in the schooling of children.[1] The additional roles that parental preferences, sibling composition, and rivalry play are also widely acknowledged, and are

[1]Evidence that supports the importance of credit constraints for child labor is provided by Jacoby and Skoufias (1997), Beegle, Dehejia, and Gatti (2003), Edmonds (2004), or Guarcello, Mealli, and Rosati (2003).

documented by numerous empirical studies (Parish and Willis 1993, Psacharopoulos and Patrinos 1997, Morduch 2000, Emerson and Souza 2002). Although a large number of (earlier) studies fail to find robust evidence of income effects for child labor (e.g., Ray 2000, Canagarajah and Coulombe 1997, Psacharopoulos and Patrinos 1997), it is widely acknowledged that poverty and household income are among its major determinants.[2] The measured income effects often suffer from endogeneity problems as income is jointly determined with child labor, and are confounded by substitution effects that affect the incentives of labor and schooling.

The ambiguous effects of land and asset ownership in rural societies have been stressed by Cockburn (2001) and Bhalotra and Heady (2003). The latter authors argue that because of land and labor market imperfections, the ownership of productive assets captures not only wealth but also incentive effects. Wealth effects tend to reduce child labor not only directly but also by improving the credit–worthiness of a household and hence mitigating the adverse effects of imperfect credit and insurance markets. At the same time, if it is difficult to hire productive labor (or to buy and sell assets easily), the children of asset–rich households will be more likely to work on the family farm, and less likely to attend school. By a related argument, children can more easily contribute to family income in families that operate a business. Although families involved in small–scale business are usually also more wealthy, this income effect is reduced or even overturned by incentive effects. Parikh and Sadoulet (2005) document that in Brazil, children of self–employed or employer parents are more likely to work than other children. Edmonds and Turk (2004) find that in Vietnam the creation of a business within a family between 1993 and 1998 increased the likelihood of children's work, both in the business and within the household. Fafchamps and Wahba (2006) show that in Nepal proximity to a city is positively correlated with market and family business–related activities of children, while in rural households children work more on the family farm and in the household. These studies emphasize that the role of poverty for child labor is not unidimensional; opportunities for child work might be created through rising economic activity. Studies that condition child labor outcomes on measures of overall economic activity stress the importance of incentive effects for child labor. Kambhampati and Rajan (2006) find that market work participation of Indian children in 1992 was ceteris paribus higher (and school enrollment lower) in those states that experienced a higher regional GDP growth during the preceding decade. They argue that the relatively lower labor market participation rates in poorer Indian states like Bihar and Uttar Pradesh (which are at the focus of the present analysis) might reflect missing opportunities for children.[3]

[2]These earlier studies neglect the endogeneity of household income to child labor which biases their estimates of income effects downwards. See Bhalotra and Tzannatos (2003) for a survey of early studies on child labor and a discussion of the most common specification problems.

[3]A similar argument has been put fort by Swaminathan (1998) who notes that in the North Indian Gujarat province (in city Bhavnagar) growth has led to a larger informal market and hence a rise in the numbers of child street workers.

While a large part of the literature focuses on one specific occupational decision (market work, domestic work, or school), much can be learned about the work–school trade–off when addressing occupational choice simultaneously. Child work and schooling are directly conflicting alternatives. Work performed by children clearly reduces time spent in school,[4] while educational attainment is lower for children who combine work and school (Beegle, Dehejia, and Gatti 2004, Heady 2003, Orazem and Gunnarsson 2004).

The schooling–labor decision is often addressed in a multinomial logit framework. Here child occupational status is categorized according to the the different possible outcomes. Most typically, the school only, work only, combine school and work, and stay idle alternatives are estimated by a multinomial logit model (see e.g., Levison, Moe, and Knaul 2001, Maitra and Ray 2002, Ersado 2005, Cigno and Rosati 2005, Bacolod and Ranjan 2006). One potential problem of this approach lies in the "Independence of Irrelevant Alternatives" assumption which presupposes that the relative probabilities of any two alternative occupations are not influenced by the existence of other alternatives. The results of such studies might be biased if domestic chores as alternative remains unexplored.[5]

Another strand of literature on the topic of child work–schooling trade–off is based on bivariate regressions with two dependent variables, work and school attendance (starting with Canagarajah and Coulombe 1997, Nielsen 1998).[6] Many bivariate studies define work as market work only and consider children performing household chores as idle (e.g., Pal 2004, Ganglmair 2006). Other studies consider market work and various domestic chores as a joint category of child work and analyze in contrast to schooling (e.g., Ravallion and Wodon 2000, Ersado 2005). In countries with relatively large gender disparities (such as India but other South Asian countries), both procedures capture relatively well the work–school trade-off for boys, however, they are less suitable to address the trade–offs involved for girls. The first procedure neglects a large proportion of working girls while the second one does not take into account the inherent differences between the determinants of girls' domestic and market work.[7]

[4]This holds true even when substitution is less than perfect as argued by Ravallion and Wodon (2000) who find that hours of child work decrease by less than the increase in their school participation as a response to a food subsidy in Bangladesh. For a recent review on the work–schooling trade–off see Ganglmair (2006).

[5]A work around for this problem is given by estimating sequential probit models, however, identifying assumptions are needed in order to establish a decision hierarchy (i.e., parents first decide whether to send their children to school and then whether to combine schooling with other activities) (e.g., Cartwright 1998, Grootaert 1998). Such decision structures are artificially imposed and not appealing on a priori grounds.

[6]For the first bivariate probit analysis of child work and school attendance in India see Duraisamy (2000).

[7]A notable exception is the work of Kambhampati and Rajan (2004) who address market work, household chores, and study of Indian children in a trivariate framework, but do not allow for combinations of different activities.

This point is also emphasized by Levison, Moe, and Knaul (2001) who compare the trade–off between school and market work or school and all types of work in Mexico, and find that the first procedure underestimates the trade–offs for girls.

The present paper considers the outcomes market work, household chores, and study in a more systematic way, and models them as simultaneously determined in a trivariate framework. It emphasizes especially the role of economic incentives for both market and domestic work, and finds that the differences between the work–school trade–off for girls and boys are mainly due to the market work–domestic work dychotomy. The empirical specification also incorporates several of the insights of the literature. Houeshold income is instrumented with prices, and other wealth proxies which helps to reduce the downward bias in the income effect. The procedure also reduces the confounding income effects captured by other variables like land ownership, operating a family business, or village–level workforce participation and wages. As a consequence, the incentive effects of these explanatory variables are more explicitly measured.

## 2.2 A stylized model of occupation choice

The joint decisions on child labor and school attendance are modeled in a stylized two–period framework ($t = 1, 2$) where a unitary decision–maker decides about household consumption and time use of children. The number of adults and children are each normalized to one, and general household and community characteristics are depicted by the vectors $\Theta$ and $\Omega$ respectively. For expositional ease, decisions on second period time use are suppressed, and it is assumed that both adults and children perform full time market work in period two.[8] The time spent with studies in period one is denoted by $S$, hours of market related work by $L_{c1}$ and $L_{p1}$, household work by $H_{c1}$ and $H_{p1}$ where the subscript $c$ stands for children and $p$ for parents. Parents maximize household utility over the two periods by considering the utility of consumption, the disutility of labor, and the utility of schooling.

$$\max_{C_t, L_{c,p1}, H_{c,p1}, S} U_1(C_1, L_{c1}, H_{c1}, L_{p1}, H_{p1}, S; \Theta, \Omega) + U_2(C_2; \Theta, \Omega) \tag{1}$$

The intertemporal utility maximization problem is subject to budget and time constraints. The household's productive assets $A_0$ are assumed to be exogenously given at the beginning of the first period; monetary assets are denoted by $B_0$ (bequest) and $B_1$ (borrowing). Credit market imperfections are taken into account using the costs of borrowing $g(A_0, B_1; \Theta, \Omega)$, which decrease with the collateral of physical assets, and depend on individual and community characteristics. Household income is generated by a typical household production function $f_t$ with decreasing returns. Labor inputs

[8] The present model builds upon the framework of Bhalotra and Heady (2003) and extends it with domestic work while abstracting from decisions on land tenancy and hiring labor.

of children and adults directly contribute to the first period income $f_1$, while second period income consists of household production $f_2$ and the child's second period earnings $w_{c2}$. These depend not only on education, but also on the labor experience in the first period, and on local labor demand captured by $\Omega$. The costs of schooling $P(S;\Omega)$ are convex in the amount of schooling $S$ and depend on school availability and quality in the community. Household chores are defined as a necessary activity (amount $\bar{H}$) which is conditional on household characteristics $\Theta$ and produces no direct income. However, if children are helping with domestic work, they raise the earning capacity of the adults in the first period. In the first period parents maximize utility (1) subject to the following income and time constraints:

$$C_1 = f_1(A_0, L_{p1}, L_{c1}; \Theta, \Omega) - P(S;\Omega) + B_0 + B_1 \tag{2a}$$

$$C_2 = f_2(A_0, L_{p2}; \Theta, \Omega) + w_{c2}(S, L_{c1}; \Omega) - g(B_1, A_0; \Theta, \Omega) \tag{2b}$$

$$H_{c1} + H_{p1} \geq \bar{H}(\Theta) \quad H_{c1} + S + L_{c1} \leq 1 \quad H_{p1} + L_{p1} \leq 1 \tag{2c}$$

They divide their own time and that of their children (both normalized to unity) between market work, household chores, school (children only), and leisure. Consumption, income and time use of parents and children are endogenously determined as a function of exogenous assets, and household and community characteristics. The shadow price of income in period one and two are denoted by $\lambda_1$ and $\lambda_2$, and the shadow price of the constraint on household work $\bar{H}$ by $\lambda_3$. The following first order conditions are directly related to the time use of children:[9]

$$\partial U_1/\partial C_1 = \lambda_1, \quad \partial U_2/\partial C_2 = \lambda_2, \quad (\partial g/\partial B_1)\lambda_2 = \lambda_1 \tag{3a}$$

$$\partial U_1/\partial L_{c1} + \lambda_1 \partial f_1/\partial L_{c1} + \lambda_2 \partial w_{c2}/\partial L_{c1} \leq 0 \tag{3b}$$

$$\partial U_1/\partial S - \lambda_1 \partial P/\partial S + \lambda_2 \partial w_{c2}/\partial S \leq 0 \tag{3c}$$

$$\partial U_1/\partial H_{c1} + \lambda_3 \leq 0 \tag{3d}$$

As a result, the marginal utility of consumption over the two periods is equalized up to the extent allowed by credit market imperfections (eq. (3a)). Market work of children is interior if (3b) holds with equality, that is if the sum of the value of marginal product of labor performed by children and their returns from learning–by–doing are at least as high as the disutility of child labor. Children attend school if the marginal utility of education and the returns to school are not smaller than the marginal costs of schooling, that is if (3c) is binding. Children help with domestic chores when the marginal disutility of this work is not larger than the shadow price of parental time ((3d) is binding). This in turn is determined by parental preferences and by the value of marginal returns of the alternative use of parental time.

[9]For simplicity, only decisions are considered that are interior with respect to leisure, i.e., the time constraints in (2c) are assumed to hold with strict inequality.

This relatively simple framework has numerous implications for the work–school trade–off of children. It acknowledges that children can also accumulate farm or business–specific knowledge which reduces the relative returns of schooling and shifts the trade–off more towards work. Ownership of productive assets $A_0$ plays an ambiguous role. It raises present and future income and also reduces the costs of borrowing which allows for a better equalization of marginal utilities between present and future consumption (see eq. (3a)). However, it also raises the marginal product of child and adult labor, making market work by children and parents more profitable. This incentive effect affects not only market work by children, but also their domestic duties if the marginal value of parental time increases with the assets.[10] The relative quality of human capital accumulated by working might also depend on future employment perspectives: Children of farm and business owners who will inherit the productive assets benefit more from learning–by–doing. Another part of incentive effects is due to differences in current and prospective labor market opportunities. Labor market outcomes like adult labor force participation, unemployment, or wages might reflect current labor demand and affect both household income and the incentives to send a child to work.

If returns to formal and informal education $\partial w_{c2}/\partial S$ and $\partial w_{c2}/\partial L_{c1}$ are lower for girls, as is generally argued for India (e.g., Kingdon 1998), girls will be less likely to go to school, or to perform market work. When social norms and value judgments restrict girls' work outside the home, the marginal disutility of market work becomes also gender specific. Additionally, as Indian girls usually leave the family upon marriage, the benefits from their formal and informal education cannot be appropriated by the family (Kambhampati and Rajan 2004). This further reduces the incentives to invest in the education of girls. These effects all contribute to girls specializing in household chores. The main difference between children who perform domestic work and those who stay idle results mainly from two factors: all else being equal, children are more likely to stay idle if household income is higher, and if economic opportunities are lower, that is when the marginal value of parental time is lower.

## 3 Data and main variables

The analysis is based on data from the "Survey of Living Conditions" of two Northern Indian provinces, Uttar Pradesh and Bihar. The survey was carried out between December 1997 and March 1998 as a part of the World Bank Living Standards Measurement Study (LSMS) series. The quantitative part of the survey is comprised of a household questionnaire and a village–level dataset with community–level characteristics. It contains data from 120 villages in two selected regions of Uttar Pradesh (Eastern and Southern) and two of Bihar (Northern and Central) where 2250 house-

[10] The effect arises if asset and labor markets function imperfectly, i.e., if land cannot be easily sold or bought, and hired labor is imperfect substitute for child work (Bhalotra and Heady 2003).

holds were interviewed.

### 3.1 Activities of children and adolescents

The survey presents detailed socio–economic information about the households and their members. The main economic activities of each family member for the previous 12 month period were recorded. As the dataset does not contain information on time use for all types of work, the three dependent variables of interest (market work/household chores/school attendance) are defined as binary indicator variables that show whether a child aged 10–17 years participates in a given activity. Although economic activities of younger children would deserve special attention, the household questionnaire records only economic activities of children aged 10 years or older. The relatively broad age limits are chosen because it allows a focus on the work and school trade–off of both children and adolescents. The two major breaks in work participation and school attendance rates occur at 14 and 17 years (see Table 3). About 40% of the 17 year old adolescents still attend school, which is in part due to grade repetition and late school entry (c.f. Table 4).

The subsequent empirical analysis defines a child as working if he or she has been reported as working some time during the last year, either in form of market work or household chores. *Market work* is defined to include all directly productive activities of children, irrespectively of whether they have been performed within or outside of the household. It includes not only wage labor (paid in cash or in kind), but also unpaid work on the family farm or in the family business. *Domestic work* includes the category of "domestic duties" (i.e. cleaning, cooking, or looking after younger siblings) but also fetching water, collecting firewood, and foraging. Children are classified as students if this has been one of their reported main economic activities for the previous year or if they actually attended school within the last week before the survey.

The main difference between market and domestic work is not whether it has been performed within the family, but whether it involved activities that target market production. This broader definition of market work differs from studies concentrating on wage work only (e.g., Maitra and Ray 2002), and takes explicitly into consideration the economic contribution of children who are helping in small–scale business and home–production. This is especially important as globally only a relatively small fraction of children works for wages; most children are employed by their own parents and are working on family farms or in family business (Edmonds and Pavcnik 2005a). Unlike in other studies (e.g., Kambhampati and Rajan 2004), not only the primary activity of a child is considered, but all major activities are recorded that children have been performing during the year previous to the survey. This is important, as there might be a considerable seasonality to child labor, especially in activities related to agriculture. It also allows for the fact that child labor and school attendance need not

Table 1: **Activities of children and youth (10-17) by gender (%)**

| | Male | Female | Total |
|---|---|---|---|
| One occupation only | 86.2 | 86.3 | 86.3 |
| Market work | 15.9 | 6.8 | 11.9 |
| Domestic work | 2.4 | 36.9 | 17.9 |
| At school | 67.8 | 42.6 | 56.6 |
| Combine | 4.6 | 7.7 | 6.0 |
| Market and domestic work | 0.5 | 4.3 | 2.2 |
| Market work and school | 2.9 | 1.0 | 2.1 |
| Domestic work and school | 1.1 | 1.9 | 1.5 |
| All types | 0.1 | 0.5 | 0.3 |
| No occupation | 9.3 | 6.0 | 7.8 |
| Total | 100.0 | 100.0 | 100.0 |
| *N* | 1318 | 1067 | 2385 |

be exclusive, and enables us to consider explicitly those children who combine different activities. In the sample, 4.1% of boys and 3.4% of girls are reported to be combining work and school, while girls also combine market and domestic work to some extent (4.8%) (c.f. Table 1).[11] Additionally, there is a relatively large number of children who are reported as idle. The phenomenon of idle children is quite common to surveys conducted in India, and has been argued to result from both the under–reporting of child work, and the low productivity of child labor (Cigno and Rosati 2000).

The distribution of children's activities within the sample reveals a clear gender pattern; while 51.5% of girls aged 10-17 are working, only 22.9% of the boys of the same age perform any kind of work (Table 1). The main source of this gender gap lies not in market activities (12.7% of girls and 19.4% of boys perform market work), but in domestic chores which are performed almost exclusively by girls (43.6% of girls as compared to 4.1% of boys). A significantly higher proportion of boys (71.9%) than girls (45.9%) in this age group is enrolled at school.[12]

[11] In some cases, these numbers might also reflect under–reporting of child work; parents might not report work by children whom they primarily consider as students.

[12] The apparent difference between the numbers of girls and boys within the sample (with a female to male ratio of 0.81) might reflect two phenomena. First, girls have significantly more younger male siblings than boys which indicates that there might be a target number of sons in a family. Second, as widely argued (see e.g., Sen 1992), discrimination against girls in the allocation of food and health care in South Asia leads to a substantial gender gap in child survival rates. The two North–Indian provinces in the sample are both severely affected by this issue: in 2001 the average sex ratio of females to males was 0.898 in Uttar Pradesh and 0.919 in Bihar as compared to the Indian average of 0.933 (Census of India 2001).

## 3.2 Explanatory variables

The vector of explanatory variables includes personal characteristics, socio–economic characteristics of the household, neighborhood variables, and village–level controls. At the household level, information on household income and asset ownership, family business, educational attainment, and household structure is used. Neighborhood variables measure school enrollment within the neighborhood while village–level controls include measures of labor market outcomes.[13]

### 3.2.1 Controls for income and incentive effects

**Measuring the effects of household income** As outlined earlier, there is a clear theoretical linkage between household income and child labor. If child leisure is a normal good, children from wealthier households will be less likely involved in work. Additionally, when schooling investments are suboptimal due to credit constraints, a rise in income will shift the work–school trade–off in favor of more schooling. To the extent that working adolescents contribute to household income, simple estimates of the income effect can be expected to be biased downwards. The estimates of the income effect are potentially also affected by other confounders. Instruments for income that are less likely to be influenced by work of children can help to mitigate this downward bias (see Section 4).

Yearly household income includes income from four major sources: the labor income of all family members (except for children), the income from running a business, the market value of own agricultural production over the past year, and the value of pensions/transfers received from outside the household.[14] *Household income* is the natural logarithm of the yearly household income per adult household member (aged 18 or above). The instruments include the monetary value of large machines owned by the household (in per adult terms), an indicator of neighborhood electricity supply, village–level wheat and sugar prices, and a measure of distance to services. Results from the first stage regressions of income are presented in columns (1) and (2) in Table 7. The instruments have been selected based on their correlation with household income and excludability from the univariate IV–probit regressions of the three dependent variables. It is difficult to find genuinely exogenous instruments for income in household surveys, and all of the above wealth–proxies depend obviously on household income. However, they are arguably less influenced by the work of

[13] All regressions control for the age and martial status of a young person. Both work and school participation are reasonably linear in age, and hence in final regressions no higher order terms of age are included.

[14] Most outside transfers come from family members living outside the household. Their value has not been excluded from the overall family income as they have a clear wealth effect on child work and are endogenously determined along with household income (depending on household structure, cultural norms, and jointly determined with the household's labor market decisions).

children, and affect it mostly through wealth effects.[15] The tests of overidentifying restrictions (Table 2) support this assertion by not rejecting the hypothesis that the instruments are uncorrelated with child labor when adding them to the second stage regressions. When using these instruments, the downward bias in income is reduced, and the estimated income effects become relatively larger.

Table 2: **Tests on validity of the instruments**

| | | Wald-test of exog. | | Hansen's J | | And.-Rubin | |
|---|---|---|---|---|---|---|---|
| | | $\chi^2(1)$-stat. | $p$ | $\chi^2(2)$-stat. | $p$ | $\chi^2(2)$-stat. | $p$ |
| Boys | Market w. | 3.29 | 0.070 | 1.06 | 0.787 | 0.98 | 0.807 |
| (N=1318) | Domestic w. | 5.86 | 0.015 | 2.33 | 0.507 | 3.50 | 0.321 |
| | Student | 5.33 | 0.021 | 4.93 | 0.177 | 5.82 | 0.121 |
| Girls | Market w. | 4.55 | 0.033 | 1.19 | 0.550 | 2.30 | 0.317 |
| (N=1067) | Domestic w. | 4.78 | 0.029 | 0.27 | 0.872 | 0.80 | 0.445 |
| | Student | 6.26 | 0.012 | 0.31 | 0.856 | 0.80 | 0.443 |

*Notes*: Test statistics on three tests concerning the instrumental variables are reported. The Wald test on exogeneity tests the null hypothesis of exogeneity of family income in univariate probit regressions of each category of time use. The other two statistics report tests of overidentifying restrictions (on the exclusion of the instruments from the second stage) where each equation is estimated by GMM (Hansen's J-stat.) and LIML (Anderson-Rubin stat.).

Village level prices (of wheat for boys, of unrefined sugar for girls) are determined by goods supply and demand in the village but are most likely exogenous to decisions of an individual household. They are correlated with household income but uncorrelated with child work and study.[16] Access to electricity in the neighborhood reflects neighborhood wealth and is a strong predictor of household income (see Cigno and Rosati 2005, Ch.6). But the presence of electricity infrastructure could also influence work of youth directly, for example, by affecting labor productivity and determining the set of economic activities that can be productively pursued at home. While there is certainly a clear negative (positive) correlation between access to electricity and participation of a child in work (study) in the sample, the overall effect of electricity supply on the work–school trade–off becomes insignificant when additional controls of family income and asset ownership are included. The same holds true for the value of machines per adult. It is negatively correlated with child work but the major part of this correlation can be explained by a wealth effect.[17] A certain downward bias

[15] All variables used as instruments might also affect child labor through channels other than the wealth effect. Nevertheless, the income effects of these variables are arguably much more important than the substitution effects, which are not measurable.

[16] Although there are cases where variation in prices over time measurably influences child labor outcomes (see Edmonds and Pavcnik (2005b) for rice price increase in Vietnam), when controlling for household income and other household characteristics, no substitution effects from cross–village variation of prices on children's occupation could be found.

[17] In agricultural production, machines can substitute for child work but also complement it, e.g., if children receive higher returns from learning–by–doing (as opposed to school) in households with better equipment. The sign of the overall substitution effect is unclear, but is clearly insignificant in

might be still involved in the estimates of the income effect if wealth generated by the economic contribution of children is used to buy machines. This possibility cannot be excluded, although this effect is not likely to be very strong. In boys' regressions the value of machines is also interacted with an indicator for remoteness from certain services (pharmacy, bank, and police station).

The Wald–test of exogeneity in Table 2 shows that the exogeneity of income can be rejected in all univariate probit regressions. The tests on overidentifying restrictions indicate that the instruments are valid in the sense that they are correctly excluded from the estimated second–stage equations. The presented Hansen-Sargan and Anderson-Rubin test statistics (see e.g., Hayashi 2000, 227-228) test the joint null hypothesis that the set of instruments is uncorrelated with the error term (when estimating a linear model by a GMM or a LIML procedure) and can be rejected at all common significance levels. They indicate however that the instruments perform better in regressions on girls' work and school participation.[18]

**Ownership of land and family business** Ownership of large household assets (land), or the presence of a small–scale business within the household can be expected to have both income and substitution effects on child labor. Both land–holdings and business activities lead to a higher yearly income all else being equal (Table 7). At the same time, they can also raise the marginal product of child work and hence the incentives for child work within the family. Asset owner households might also differ with respect to their norms concerning work and school of children. Kambhampati and Rajan (2004) argue that large land–holdings in Northern India indicate a more patriarchal society with an especially large gender gap in actual and perceived returns to education. As land ownership and family business are also included in the first stage regression predicting income, coefficients on land and family business in the second stage regressions to a large extent capture these incentive and taste effects.

The nonlinear effect of land holdings is accounted for by controlling for different categories of land ownership (in acres) per adult (compared to families with no land holdings). Land is defined as marginal if it is below 0.5 acres per adult, small if it is between 0.5 and 2 acres per adult, and large if it is above 2 acres per adult.[19] This

the sample.

[18]Most p-values for the test statistics are well above 0.30. The only exception is school enrollment of boys with relatively low p-values, which still allows for the rejection of the null at the 10% level. Here neighborhood electricity still has an additional (although not highly significant) effect, possibly as a proxy for school quality.

[19]For an average landowner family with 3.6 adults, these categories roughly reflect the classification of land categories by the Indian Census (Bhalotra and Heady 2003, p.208), which defines land as marginal if it is below 1 ha, as small if it is between 1 and 3 ha, and as large if it is above 3 ha (1 ha equals 2.7 acres). For households that did not answer the land ownership questionnaire, zero land has been imputed. The resulting bias should be relatively small, as almost all households that gave no answer to these questions reported agriculture as neither a primary nor secondary income source.

specification performs better than including land ownership and its square directly in the regressions, which indicates that the most significant differences lie between owners of large land and the other households.

The effect of family business is captured by an indicator of whether any adult family member is self–employed in a small–scale business. Such businesses include processing and selling food (e.g., milk products, flour, cigarettes, or alcohol), small–scale manufacturing, and personal services (repair, massage, etc.). One might argue that the decision of the families taking up a business depends on whether there are young children who are able to help out and hence it is jointly determined with child work. As it can be seen from a probit regression of the family business in Table 7, the presence of young family members (*Young share*) does not make self–employment more likely per se. Nevertheless, for any given family structure, tastes for self–employment might coincide with value judgments about the necessity of child labor. In this case the indicator of family business captures not only labor demand, but also preference effects.[20]

**Incentive effects proxied by labor market outcomes** All regressions include controls of local labor market outcomes. This is of particular interest as many empirical studies on child labor do not include demand–side determinants of child labor (Bhalotra and Tzannatos 2003). Local wage and labor force participation or unemployment rates reflect economic opportunities within the village and proxy substitution effects of labor demand on child labor and schooling, once income effects have been controlled for. *Female wages* are based on the village level questionnaire and represent the average of daily wages for different occupations in agriculture. Wages for males are not included in the final regressions because male and female wages are highly correlated (partial corr. coeff. 0.70) and female wages outperform wages for males in each specification.[21] Based on data from the individual sample, *Male unemployment* approximates the unemployment rate of adult males in the village, while *Female work–ratio* measures the proportion of adult females in the village sample who perform any market related work.[22]

[20]From Table 7, we also see that the probability of operating a business falls with land ownership, and rises with male and female literacy. Self–employment is negatively associated with the share of females within the family, is more likely among Muslims and less likely among the members of scheduled castes and tribes.

[21]In alternative regressions that included male wages only, male wage levels had no significant effect. This might also indicate that children are more closer substitutes to female labor.

[22]Local unemployment rates are calculated for males only, as it is almost exclusively males who report being unemployed. For female workforce participation, labor is broadly defined to include paid labor, but also self–employment, work on the family farm, or in the family business. Village–level measures of labor participation are clearly preferred to the inclusion of the labor market status of the parents (and especially of the mother) as these are most likely simultaneously determined with the work status of children.

Although unemployment in the family might raise the need for economic contribution by adolescents, for any given level of household income the extent of male unemployment in the village is more likely to capture labor market opportunities. Average female wages measure directly the opportunity costs of schooling and of domestic activities, especially for girls. Female workforce participation not only reflects local labor demand but it is also strongly related to social norms with respect to the economic role of females. Whether children are more or less likely to work ceteris paribus in villages where female workforce participation is higher, is a priori unclear. To the extent that market work by females reflects labor demand effects, it also indicates more direct opportunities for market (and eventually also domestic) work of children. Better opportunities in the labor market in the long–term might favor both market work and schooling of girls as means of human capital accumulation. The aspect of social norms is most important for girls: In villages where more females work, girls' labor force participation is also less prohibited by social norms. These effects might be counteracted by the rising decision making power of females. If females are more concerned about child work and schooling, their economic power will shift the work–school trade–off in favor of more schooling.

### 3.2.2 Other controls

**Educational attainment within the family** For given levels of income and wealth, controls of educational attainment act as proxies for tastes and value judgments concerning education and work within the family. Instead of the more generally used parental education, household–level averages of educational attainment are included as regressors. *Male literacy rate* and *Female literacy rate* measure adult literacy within the household for both sexes. *Prop. of educated males* measures the proportion of male adults within the household who finished at least middle education. These variables capture general attitudes towards education and work within the household and allow the inclusion of children who do not have both parents present.[23]

**Household composition and family structure** Since all economic variables are normalized by the number of adult household members, controls of household composition are also measured in relative terms. The variables *Infant share* and *Young share* measure dependency ratios of children aged between 0 and 9 years and between 10 and 17 years to the adult family members. The larger the relative share of small children

[23]For children living with both parents, female and male literacy rates are highly correlated with parental literacy (correlation coefficients for both sexes over 0.905), while secondary education of the father and males in the family have a correlation coefficient of 0.608. No measure of female secondary education is included as it acts as perfect predictor of certain outcomes. Alternative regressions, with mother's and father's educational status as explanatory variables, led to very similar results for the restricted sample.

in a household, the larger the potential need for help in child–care related activities, especially from older girls. A larger relative share of adolescents might also raise the need for their economic contribution. In order to capture potential birth order effects, the birth order among the siblings of the same sex is also included. Birth order effects might reflect parental preferences for first or later born as well as the presence of credit constraints: Earlier born children might have to work more while having older siblings might help to postpone employment of the young (Psacharopoulos and Patrinos 1997, Emerson and Souza 2002). For a detailed investigation of sibling composition effects see Edmonds (2006) who shows that the comparative advantage of older females in household chores changes with younger siblings' number, gender, and birth spacing.

*Female share* additionally controls for the sex composition of the adults in the family while *Elderly share* measures the share of elderly (aged above 66 years) who are potentially inactive. The first stage regressions (Table 7) show that household income per adult is smaller in families with a relatively larger share of females among the adults, and a relatively larger share of elderly. This indicates that both females and elderly contribute less in monetary terms to household income. However, their non–monetary contributions might be an important additional determinant of the work–school trade–off.

While in the long run, education and work of children are most likely to be jointly determined with the number of siblings (Becker and Lewis 1973), all estimates are conditional on the given family composition. Family structure and dependency rates might all depend on household wealth, and are jointly determined with the occupational choices of adolescents. However, like other studies in this field, this analysis is conditional on the given household structure and treats family composition as exogenous in the short run.

**Costs of schooling and neighborhood effects** Higher costs of schooling can be expected to reduce school participation, while also reducing the opportunity costs of child work. Schooling costs involve two main dimensions: the monetary costs of schooling, given by tuition fees, school supplies, uniforms, and other costs, and the opportunity costs of time, measurable by school availability. Differences in the direct costs of schooling are proxied by yearly expenses for a primary school student in each village.[24] In order to reduce the problem of comparability of school types, only costs of attending primary school (classes 1 to 5) are included. This school costs variable has a clear advantage (see e.g., Cartwright 1998, Ersado 2005): While it does not depend on the parental decisions concerning individual school attendance, it does reflect the

[24]This measure is somewhat crude: it might over–estimate the costs of schooling as school choice is endogenous to the individual willingness to pay for education, and school costs might also be positively correlated with unobservable school quality.

average costs of all available schools in or near to the village. The effect of school availability is captured by the variable *Time to school* which measures the time it takes to reach the nearest secondary school for each household. Another proxy for school availability and social norms on schooling is based on the answers of village officials to the question about what proportion of school–aged children actually attends school within a given neighborhood. The variables *Half to school* and *Less to school* indicate neighborhoods where school attendance is reported to be low (comparison group is when almost all children attend school).

# 4 Estimation strategy

The empirical analysis estimates simultaneously the three participation decisions in market work, domestic work and school resulting from the optimality conditions in equation (3). The three latent variables, market work $L^*$, household chores $H^*$, and school attendance $S^*$, depend on a vector of explanatory variables $\mathbf{X}$, three unknown vectors of parameters $\boldsymbol{\beta}_L, \boldsymbol{\beta}_H, \boldsymbol{\beta}_S$, and the normally distributed error terms $\epsilon_L, \epsilon_H, \epsilon_S$. As the three choices are conflicting alternatives of children's time use, and are determined simultaneously by the same decision making process, the same $\mathbf{X}$ vector of explanatory variables is included in all three equations.

$$\begin{aligned} L^* &= \mathbf{X}'\boldsymbol{\beta}_L + \epsilon_L \\ H^* &= \mathbf{X}'\boldsymbol{\beta}_H + \epsilon_H \\ S^* &= \mathbf{X}'\boldsymbol{\beta}_S + \epsilon_S \end{aligned} \tag{4}$$

The three equations from (4) are then mapped into three binary variables $Y_j$ ($j = L, H, S$) that take one if the child engages in a given activity, and zero otherwise.

$$Y_j = 1(\mathbf{X}'\boldsymbol{\beta}_j + \epsilon_j > 0) \qquad j = L, H, S \tag{5}$$

Endogeneity of income can be addressed by a two–step limited information procedure (Rivers and Vuong 1988) which decomposes the vector of explanatory variables $\mathbf{X}$ into the endogenous income variable $x$ and the vector of exogenous variables $\mathbf{Z}_1$. At the first stage of the two–step procedure, income is regressed on the set of exogenous explanatory variables $\mathbf{Z}_1$, and a set of instruments $\mathbf{Z}_2$. At the second stage, the residuals $\widehat{v}$ from the first stage are included as an additional regressor in each equation.

$$x = \mathbf{Z}_1'\boldsymbol{\delta}_1 + \mathbf{Z}_2'\boldsymbol{\delta}_2 + v \tag{6a}$$

$$Y_j = 1(\mathbf{Z}_1'\boldsymbol{\beta}_{1j} + \alpha_j x + \theta_j \widehat{v} + e_j > 0) \qquad j = L, H, S \tag{6b}$$

The underlying assumption is that the error terms in the income and participation equations are jointly normal and hence the error terms in the latter can be decomposed

into two error components $\theta_j \widehat{v}$ and $e_j$ (Wooldridge 2002, 472-475). The first part of the error components are correlated with $v$, and $\theta_j$ is directly estimated for each equation, the second parts are independent of $v$ and $x$ and jointly normal.[25]

The joint estimation of the three participation equations (6b) involves the evaluation of the loglikelihood over $i = 1, \ldots, N$ observations, based on a joint trivariate probability:

$$\ln \mathcal{L} = \sum_{i=1}^{N} \ln \Phi_3(\kappa_{Li}\mathbf{Z}_i'\boldsymbol{\gamma}_L, \kappa_{Hi}\mathbf{Z}_i'\boldsymbol{\gamma}_H, \kappa_{Si}\mathbf{Z}_i'\boldsymbol{\gamma}_S, \kappa_{Li}\kappa_{Hi}\rho_{LH}, \kappa_{Li}\kappa_{Si}\rho_{LS}, \kappa_{Hi}\kappa_{Si}\rho_{HS})$$

where $\Phi_3$ is the trivariate normal cumulative density function, $\mathbf{Z}_i'\boldsymbol{\gamma}_j = \mathbf{Z}_1'\boldsymbol{\beta}_{1j} + \alpha_j x + \theta_j \widehat{v}$ $(j = L, H, S)$ are the combinations of explanatory variables and coefficients as in (6b), $\rho_{LH}, \rho_{LS}, \rho_{HS}$ are the three correlation coefficients of the error terms between the equations, and $\kappa_{L,H,S}$ are the corresponding sign variables that equal to one if a child engages in a given activity, and minus one otherwise (Greene 2003, 710). The estimation of this function requires the computation of derivatives of third order integrals for which no general solutions exist. However, the problem can be addressed by recently developed simulation techniques: The method of simulated maximum likelihood allows the estimation of a trivariate probit model by using the GHK (Geweke-Hajivassiliou-Keane) smooth recursive estimator (see Greene 2003, pp. 931-933). The estimation assumes that the error terms of the three participation equations $\epsilon_L, \epsilon_H, \epsilon_S$ are jointly normally distributed with a covariance matrix $\Sigma$. The three correlation coefficients between the three sets of error terms $\rho_{LH}$, $\rho_{LS}$, and $\rho_{HS}$ summarize the association between unobservable individual-specific factors determining the likelihood of being engaged in different types of occupations and are estimated along with the model.

The GHK smooth recursive estimator decomposes the original three-dimensionally correlated error terms into a linear combination of uncorrelated one–dimensional standard normal variables. The trivariate distribution is thus transformed into three sequentially conditioned univariate distributions. In order to evaluate the resulting integral, $D$ random draws of these standard normal variables are taken from truncated normal distributions, and a sample average of the simulated probabilities is used to estimate the probability that enters the likelihood function.[26]

The average partial effects (APE-s) have been estimated by averaging sample partial effects, computed for each individual.[27] As two–step procedures estimate the coefficients only up to a scale, a procedure proposed by Wooldridge (2002, 475) has been

[25] The t-test of $\widehat{\theta}_j = 0$ can be interpreted as a test of exogeneity of $x_1$ within the given equation. This procedure estimates the related coefficients $\alpha$ and $\boldsymbol{\beta}_{1j}$ only up to a scale. This is taken into consideration by estimating the average partial effects (Wooldridge 2002, 475).

[26] Estimations have been implemented with Stata, using the `mvprobit`, `mvnp` and `mdraws` routines of Cappellari and Jenkins (2003, 2006). For given sample sizes (1067-1318 observations), relative stability of the simulated $\boldsymbol{\gamma}$ and $\rho$ parameters was ensured with about $D = 300$ random draws.

[27] Estimation of APE-s on marginal probabilities has been carried out based on the user–defined Stata–routine `margeff` (Bartus 2005), while estimation of APE-s on trivariate probabilities reused parts of this routine.

used: Partial effects of probit equations have been calculated for each individual by including $\widehat{\theta}_j \widehat{v}_2$, the first–stage OLS residuals multiplied by their estimated coefficient (see eqn. (6b)). Thus partial effects have been averaged across the first stage residuals of the sample.[28] Standard errors of the APE-s for the trivariate probabilities have been estimated by a computationally intensive empirical Bayes procedure. 2000 replications of the estimated coefficient vectors $(\widehat{\gamma}_L, \widehat{\gamma}_H, \widehat{\gamma}_S, \widehat{\rho}_{LH}, \widehat{\rho}_{LS}, \widehat{\rho}_{HS})$ were redrawn from a multivariate asymptotically normal distribution (characterized by the estimated variance–covariance matrix $\widehat{\Sigma}$), and the standard deviation of the partial effects was computed. This serves as an approximation of the standard error of the partial effects.

# 5 Results

Tables 8 and 9 present the results from the trivariate probit regressions.[29] The estimated correlation coefficients between market work, domestic work, and schooling reflect the nature of the main unexplained trade–offs between the three types of occupation. They show that domestic work and school are the two most conflicting alternatives for girls, market work and school for boys. The estimated correlation coefficient between the unexplained part of domestic work and school of girls amounts to -0.90, between market work and school of boys to -0.84. While all other occupations stay in conflict with each other as well, the respective correlations are much smaller. The estimated average partial effects of the explanatory variables on the marginal probability of each occupation are given in Tables 8 and 9. Tables 10 to 13 present the average partial effects on the joint trivariate probability of a given combination of the three activities where average is taken across all girls or boys in the sample (see Section 4). They show the average effect of each explanatory variable on the probability that a child specializes in one given activity (market work, domestic work, or school), combines different activities, or stays idle.

## 5.1 The role of income and incentive effects

The effects of household income have the expected signs: With rising income the probability that a child works falls, and the probability that he or she studies rises. For boys, the effects of income on education are larger than its effects on work, for girls the magnitudes of income effects on household chores and school are comparable. The effects of income on specializing in work are similar for the primary occupations of girls and boys (domestic and market work respectively). An APE of about -0.2 in Tables

[28] Wooldridge (2002, 475) shows that average partial effects calculated this way are consistent.

[29] All regressions report robust standard errors that are clustered on the village level, allowing for correlation between unobserved characteristics of children within the same village.

8 and 9 indicates that by increasing yearly per adult income by 1000 Rupees, the probability that a child performs market work in a family with yearly per adult income of 9000 Rupees decreases by 2.2%. In a family with yearly per adult income of 5000 Rupees, the same effect is 4%. Household income also raises the probability of girls staying idle, but not boys. This gender difference might be due to the lower perceived returns to schooling for girls. It is important to note that household income reduces the probability that girls specialize in domestic chores. This finding is in sharp contrast with Kambhampati and Rajan (2004) who do not find income effects for domestic work of Indian girls. However, their results potentially suffer from endogeneity of household income.

The results clearly show the incentive effects that arise from large land–holdings and from the presence of small–scale business activities. While income increases with land ownership and business activities (Table 7), for any given level of income, children are more likely to work and less likely to specialize in studies in families where their economic contribution is more easily made. Additionally, in households that live from their own production, learning–by–doing might bring relatively higher returns, compared to the returns of education, which also shifts the work–schooling trade–off more in favor of work. Girls from these households are more likely to do market work or to combine market work with other occupations, they are less likely to specialize in school and less likely to stay idle. The trade–off between (market related) work and education for boys is also affected by the same incentive effects. Boys are approximately 12% more likely to do market related work in households with family business, and around 16% less likely to specialize in school. Large land–holdings reduce their probability of staying idle or going only to school.[30] The effects of family business and land ownership on market and domestic work of children in the sample are of similar sign and of comparable size across the activities of children, but marginal effects become larger when estimated jointly in a trivariate framework.

The effects of village–level labor demand are strongly reflected in the role of adult female workforce participation in the village. This significantly raises market related work and reduces exclusive school attendance for any given level of income for both sexes. All else being equal, a 10% increase in female workforce participation raises the probability of specializing in market work by around 1% for both girls and boys and reduces the probability that a child goes only to school by around 2%. With higher female labor force participation, children are also more likely to combine school with market work. Furthermore, girls are more likely to combine market and domestic work and are less likely to specialize in domestic chores. Thus, the workforce participation

[30] If household income is not instrumented, the effect of family business becomes smaller, and loses significance for occupations other than market work. This corroborates the interpretation that family business has both income and incentive effects with a net effect which is a priori unclear. However, for any given level of income, children work more in families where there is a family business which can be attributed to incentive effects.

of adult females clearly shifts the trade–offs towards girls' market work as opposed to domestic chores or schooling. For boys, the pattern is somewhat different: when more adult females do market related activities, boys are both more likely to perform market as well as domestic work. But as only a small proportion of boys does domestic work at all, the importance of this latter effect will be limited. The effects of higher female wages are comparable to those of female participation. They reduce the probability of going only to school and raise the likelihood that boys specialize in domestic chores or that girls combine market with domestic work. Male unemployment, which reflects relatively weaker labor demand, reduces the probability that boys do market work, and raises the probability that they stay idle. Its correlation with girls' employment is less clear. Where male unemployment is higher, girls are more likely to perform any work and less likely to stay idle or specialize in school.

These findings are seemingly in contrast with results from other studies on the determinants of child labor. In bivariate probit regressions of market work and school for children in West–Bengal, Pal (2004) finds that female labor force participation reduces boys' work and raises girls' school attendance. Fafchamps and Wahba (2006) find that in Nepal, the income effects of higher village–level wages overturn the substitution effects. However, as household income is instrumented in this study and is rising with female wages and average female workforce participation, the additional effect of female wages and participation on the work–school trade–off captures a larger part of the incentive effects.[31]

The results also support the view that children are more likely to stay idle if they have less economic opportunities to work. Girls tend to be inactive in households that have no large land–holdings and no family business, and in villages where female wages and/or female workforce participation are low.[32] Boys idleness reflects economic opportunities to a lesser extent (with the exception of male unemployment), instead depending strongly on the preferences for schooling proxied by educational attainment and school attendance within the neighborhood. Although ability of the children could not be measured, idleness can also be expected to crucially depend on individual abilities. As demonstrated by Bacolod and Ranjan (2006) for the Philippines, in a family the least able children are the ones to stay idle, especially among the relatively richer families.

[31] In regressions where income is not instrumented, wage levels have no additional effect. This indicates that in this case income and substitution effects from female wages are more likely to cancel. However, the effects of female workforce participation on the market work of children remain broadly the same even if income is not instrumented.

[32] Female wages and female workforce participation are negatively correlated in the sample villages with a correlation coefficient of -0.356.

## 5.2 Further controls

The work–schooling trade–off is also affected by household composition variables. As expected, the share of smaller children within the family has a significant influence on girls' work and schooling: With one additional small child per adult the probability that a girl performs only domestic duties rises by 6%, while the probability that she only goes to school falls by about 9%. The share of teenaged children in the family raises the probability of market work and reduces the probability of school attendance. A possible explanation for this is that, for any given level of per adult income, the more adolescents in the family, the more necessary their economic contribution. Among female siblings, later born girls fare better due to birth order effects, they are less likely to perform domestic chores and more likely to go to school. Surprisingly, birth order effects cannot be detected among male siblings.[33] The results also show that although household income falls with a rising share of females and elderly (Table 7), their non–monetary contributions are important for the outcomes of child work and schooling. For any given income level, the share of elderly within the family raises the probability of school attendance for children of both sexes and reduces market work for boys and domestic work for girls. A higher share of females among adults reduces the probability that children of both sexes specialize in domestic work, as females ar more likely to share the burden of household work. The presence of females also raises the probability that a girl goes to school. This last effect might also reflect the larger decision making power of females in households with relatively fewer male members.

The role of preferences for education is captured by variables on educational attainment in the household. Both male and female literacy make a boy more likely to go to school and less likely to perform market work or to stay idle. For girls only female literacy has a robust effect; the marginal probability of a girl being involved in market work even rises with male literacy. This latter effect is more likely due to the role of incentives: If wage work and market related work within the household are treated separately, male literacy raises only the probability of female work within the family.[34] The results corroborate the well–known importance of female education, which plays the more decisive role for both girls and boys work and education.

Cultural norms, proxied by dummy variables for caste and religion, also influence the economic role of the sexes. Muslim boys, as well as boys from lower and scheduled castes, are less likely to perform domestic work; Muslim girls are more likely to specialize in domestic chores. Girls from lower and scheduled castes are more likely to work for the market, or to combine domestic chores with market work, and are

[33] Naturally, both variables might also reflect inherent differences between households with different fertility strategies (few well-educated or many uneducated children) as predicted by the theory on the quantity and quality of children (Becker and Lewis 1973).

[34] Male literacy raises the probability that a family operates a business, or is selling for the market (Table 7). Part of this incentive effect might be captured by the male literacy variable.

less likely to specialize in school. These findings are supported by Kambhampati and Rajan (2004) who find similar patterns of caste–based differences among all Indian children. They argue that this reflects the less patriarchal cultural norms among the lowest castes, which put less restrictions on the work of girls outside the household.[35]

School availability and average school costs reduce the probability that children attend only school. With rising school costs, boys are less likely to go to school and more likely to perform market work, and they are also more likely to combine market work and school. The effect of neighborhood variables is significant for both sexes. A girl is around 10% less likely to go to school if only less than the half of the school–aged children in the neighborhood go to school, compared to neighborhoods where almost all children are enrolled. As stated earlier, this might reflect neighborhood wealth, school availability and quality, but also local social norms.

With age, the probability of work rises and the probability of study falls for both sexes. Older girls are also more likely to combine different forms of work, while older boys are more likely to combine market work with school. The probability that a girl stays idle falls with her age, which does not hold for the boys in the sample. Family status has an important effect for females: Married girls are more likely to specialize in domestic duties and less likely to go to school. This can be explained by an earlier transition to adulthood for married girls, as they move out to stay with the family of their husband. As early marriage is indicative of patriarchal societies, it results mostly in domestic rather than market work.

# 6 Conclusion

The paper has presented jointly estimated participation equations in market work, domestic work, and school of North–Indian children by the method of simulated maximum likelihood. The regressions controlled for individual characteristics, household income, household composition, educational attainment, school costs and availability, and social norms like religion, caste, and neighborhood–effects. Additionally, land ownership, participation in business activities, and village–level labor market outcomes have been controlled for. Household income has been instrumented in a two–step procedure. This also allowed for a better separation of the incentive effects arising from the ownership of large land, family business, or female labor force participation and wages.

The empirical analysis has shown that the income and incentive effects for the trade–off between school and work for Indian girls and boys are of relatively similar magnitude.

[35] Splitting market work into wage work and home production and performing the same regressions with four categories shows that cet. par. girls from scheduled castes are the most likely to work for wages, while girls from lower (backward) castes are the most likely to work in family business.

The major difference between girls and boys lies in the types of work they perform. The two most conflicting alternatives are household work and school for girls, and market work and school for boys. This gender difference can be explained by a gender gap in the relative returns to both formal education and learning–by–doing as well as cultural norms with respect to the females' role. These effects are also reflected by the highly significant role of average female workforce participation in a village, which shifts girls activities from domestic towards market work. Studies that concentrate only on market work, are bound to neglect the major part of the trade–off for girls. Most importantly, the results show that the substitution effects generated by the economic incentives to work seriously conflict with school attendance and raise the probability of market work and/or domestic work for children and adolescents.

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# Appendix

Table 3: **Activities of children (10-17) by age (%)**

| Age | N | Working only | At school only | At work & school | Being idle |
|---|---|---|---|---|---|
| 10 | 525 | 19.4 | 65.5 | 2.9 | 12.2 |
| 11 | 184 | 16.3 | 73.4 | 2.2 | 8.2 |
| 12 | 443 | 27.1 | 63.0 | 4.5 | 5.4 |
| 13 | 245 | 22.0 | 66.5 | 4.5 | 6.9 |
| 14 | 244 | 30.3 | 60.3 | 4.1 | 5.3 |
| 15 | 318 | 45.9 | 42.1 | 4.4 | 7.6 |
| 16 | 283 | 55.5 | 33.2 | 3.9 | 7.4 |
| 17 | 143 | 54.6 | 36.4 | 3.5 | 5.6 |
| 18 | 384 | 66.4 | 20.3 | 3.1 | 10.2 |
| 10-17 | 2385 | 31.9 | 56.5 | 3.8 | 7.8 |
| Males | 1318 | 18.8 | 67.8 | 4.1 | 9.3 |
| Females | 1067 | 48.1 | 42.6 | 3.4 | 6.0 |

Table 4: **Age distribution of children by schoolclass attended**

| | Class attended | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Age | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | Total |
| 4 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| 5 | 12 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 |
| 6 | 137 | 41 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 181 |
| 7 | 136 | 74 | 37 | 7 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 255 |
| 8 | 97 | 124 | 89 | 30 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 343 |
| 9 | 30 | 64 | 62 | 25 | 14 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 198 |
| 10 | 38 | 71 | 86 | 61 | 64 | 22 | 8 | 3 | 0 | 0 | 0 | 0 | 353 |
| 11 | 7 | 20 | 27 | 27 | 24 | 20 | 8 | 3 | 0 | 0 | 0 | 0 | 136 |
| 12 | 11 | 18 | 30 | 48 | 55 | 53 | 45 | 19 | 9 | 1 | 0 | 0 | 289 |
| 13 | 0 | 8 | 23 | 10 | 21 | 32 | 33 | 27 | 10 | 3 | 0 | 0 | 167 |
| 14 | 0 | 2 | 8 | 11 | 13 | 12 | 17 | 36 | 36 | 17 | 0 | 0 | 152 |
| 15 | 0 | 4 | 0 | 6 | 10 | 12 | 16 | 25 | 31 | 30 | 1 | 2 | 137 |
| 16 | 1 | 0 | 1 | 3 | 3 | 4 | 5 | 17 | 19 | 36 | 7 | 2 | 98 |
| 17 | 0 | 2 | 0 | 0 | 3 | 2 | 1 | 4 | 5 | 24 | 3 | 2 | 46 |
| 10–17 | 57 | 125 | 175 | 166 | 193 | 157 | 133 | 134 | 110 | 111 | 11 | 6 | 1378 |

Table 5: **Definitions of explanatory variables**

| Variable | Description |
|---|---|
| Age | Age in years |
| Married* | Indicator variable, 1 if individual is married, 0 otherwise |
| Household income | The natural logarithm of yearly household income (in Rupees), excluding child wage income, per adult (18+) hh. member |
| Family business | Indicator variable, 1 if at least one adult hh. member is involved in small–scale business activities, 0 otherwise |
| Marginal/Small/Large land | Indicator variables that equal 1 if acres of land owned per adult (18+) hh. member are 1. between 0.0025 and 0.5 ac., 2. between 0.5 and 2 ac., 3. larger than 2 ac, 0 otherwise. Comparis. group: no land owned. |
| Female (Male) literacy rate | Proportion of literate among adult (18+) female (male) hh. members |
| Educated males | Proportion of adult (18+) males with at least middle education in the hh. |
| Infant share | Nr. of hh. members aged 0–9 relative to adult hh. members (18+) |
| Young share | Nr. of hh. members aged 10–17 relative to adult hh. members (18+) |
| Elderly share | Nr. of hh. members aged 67 or above relative to adult hh. members (18+) |
| Female share | Share of females among adult hh. members (18+) |
| Birth order (girls/boys) | Birth order among siblings of the same sex (first born: 1) |
| Lower castes* | Indicator variable, 1 if hh. belongs to a backward (agricultural or other) caste, 0 otherwise (comp. group: higher/middle castes) |
| Scheduled castes* | Indicator variable, 1 if hh. belongs to a scheduled caste or tribe, 0 otherwise (comp. group: higher/middle castes). The definition is based on *The Scheduled Castes and the Scheduled Tribes (Prevention of Atrocities) Act, 1989*. |
| Muslim* | Indicator variable, 1 if hh. belongs to the Muslim religion, 0 otherwise |
| Time to school | Time to reach the nearest secondary school (in 10s of minutes) |
| Av. school–costs | Total yearly expenses of an average child enrolled in primary school (classes 1 to 5) in the village (in .000 Rupees), calculated from the hh. sample data |
| Neighb. school (half/less)* | Indicator variables that equal 1 if 1. half or more, 2. less than half of the children in the neighborhood (tola/bustee) go to school, 0 otherwise (comp. group: "Almost all") |
| Female workratio | Labor market participation rate of adult (18+) females within the village, calculated from the hh. sample data |
| Male unemployment | Unemployment rate of adult (18+) males within the village, calculated from the hh. sample data |
| Female wages | Average daily wage rate of an adult female worker in the village (in 10s of Rupees) |
| Price (wheat) | Village level price of one kilogram wheat (in Rupees), from the village questionnaire |
| Price (gur) | Average village level price of one kilogram gur (unrefined sugar/jaggery) (in Rupees), derived from hh. –level consumption data |
| Value of machines | Value of all machines owned by the household (tractor, fodder, thresher, etc.) (in .000 Rupees) |
| Remote | Syntetic indicator of remoteness of a village; calculated as the first principal component of the distance to the nearest pharmacy, police station, and bank. |
| Neighb. electrified* | Indicator variable, 1 if neighborhood has electicity, 0 otherwise. |

Table 6: **Descriptive statistics**

| | Females | | Males | | Total | |
|---|---|---|---|---|---|---|
| Nr. obs | 1067 | | 1318 | | 2385 | |
| Variable | Mean | St. dev. | Mean | St. dev. | Min. | Max. |
| Market work* | 0.13 | 0.33 | 0.19 | 0.40 | 0 | 1 |
| Domestic work* | 0.44 | 0.50 | 0.04 | 0.20 | 0 | 1 |
| Student* | 0.46 | 0.50 | 0.72 | 0.45 | 0 | 1 |
| Age | 12.87 | 2.29 | 13.04 | 2.24 | 10 | 17 |
| Married* | 0.11 | 0.32 | 0.02 | 0.14 | 0 | 1 |
| Household income | 8.83 | 0.77 | 8.79 | 0.77 | 5.22 | 11.20 |
| Family business | 0.39 | 0.49 | 0.37 | 0.48 | 0 | 1 |
| Marginal land* | 0.39 | 0.49 | 0.37 | 0.48 | 0 | 1 |
| Small land* | 0.29 | 0.45 | 0.31 | 0.46 | 0 | 1 |
| Large land* | 0.09 | 0.28 | 0.11 | 0.31 | 0 | 1 |
| Female literacy rate | 0.22 | 0.37 | 0.19 | 0.34 | 0 | 1 |
| Male literacy rate | 0.59 | 0.44 | 0.61 | 0.43 | 0 | 1 |
| Educated males | 0.40 | 0.42 | 0.39 | 0.42 | 0 | 1 |
| Infant share | 0.67 | 0.59 | 0.57 | 0.54 | 0 | 4 |
| Young share | 0.78 | 0.48 | 0.76 | 0.47 | 0.09 | 4.00 |
| Elderly share | 0.04 | 0.11 | 0.05 | 0.11 | 0 | 1 |
| Female share | 0.48 | 0.13 | 0.48 | 0.13 | 0 | 1 |
| Birth order (girls/boys) | 1.89 | 1.03 | 1.90 | 0.97 | 1 | 7 |
| Lower castes* | 0.54 | 0.50 | 0.55 | 0.50 | 0 | 1 |
| Scheduled castes* | 0.25 | 0.43 | 0.25 | 0.44 | 0 | 1 |
| Muslim* | 0.11 | 0.32 | 0.08 | 0.28 | 0 | 1 |
| Time to school | 3.20 | 2.25 | 3.29 | 2.26 | 0 | 15 |
| Av. school–costs | 0.40 | 0.25 | 0.41 | 0.26 | 0.06 | 1.86 |
| Neighb. school (half) | 0.46 | 0.50 | 0.46 | 0.50 | 0 | 1 |
| Neighb. school (less) | 0.24 | 0.43 | 0.25 | 0.43 | 0 | 1 |
| Female workratio | 0.39 | 0.21 | 0.41 | 0.22 | 0.03 | 0.86 |
| Male unemployment | 0.02 | 0.04 | 0.02 | 0.04 | 0 | 0.18 |
| Female wages | 1.92 | 0.70 | 1.88 | 0.74 | 0.38 | 3.92 |
| Price (gur) | 12.25 | 1.69 | | | 7.22 | 19.38 |
| Price (wheat) | | | 4.59 | 0.67 | 2.75 | 7 |
| Value of machines | 1.98 | 9.38 | 2.09 | 9.39 | 0 | 136.25 |
| Remote | | | 0.04 | 1.51 | -2.16 | 5.43 |
| Neighb. electrified* | 0.47 | 0.50 | 0.47 | 0.50 | 0 | 1 |

*Notes*: Indicator variables are marked by asterisks.

Table 7: **Determinants of household income / covariates of business**

| Dependent var. | Household income (OLS) | | | | Fam. business | |
|---|---|---|---|---|---|---|
| Sample | (1) Girls | | (2) Boys | | (3) Heads | |
| | Coeff. | t-stat. | Coeff. | t-stat. | Coeff. | t-stat. |
| Age | 0.013 | 1.23 | 0.003 | 0.28 | 0.005 | 1.93 |
| Married | 0.006 | 0.08 | 0.011 | 0.06 | 0.054 | 0.51 |
| Family business | 0.427 | 6.48 | 0.359 | 5.99 | | |
| Marginal land | 0.028 | 0.41 | 0.040 | 0.48 | -0.153 | -1.48 |
| Small land | 0.194 | 2.05 | 0.278 | 3.56 | -0.462 | -3.99 |
| Large land | 0.393 | 2.96 | 0.540 | 3.73 | -0.686 | -3.69 |
| Female literacy rate | 0.335 | 3.58 | 0.204 | 1.54 | 0.276 | 2.16 |
| Male literacy rate | 0.076 | 0.99 | 0.076 | 0.86 | 0.277 | 2.71 |
| Educated males | 0.127 | 1.57 | 0.103 | 1.09 | -0.152 | -1.42 |
| Infant share | 0.075 | 1.53 | 0.025 | 0.45 | 0.081 | 1.46 |
| Young share | 0.193 | 3.08 | 0.227 | 4.37 | 0.037 | 0.45 |
| Elderly | -0.225 | -0.93 | -0.428 | -1.71 | -0.042 | -0.16 |
| Female share | -0.589 | -2.66 | -0.522 | -2.86 | -0.412 | -1.88 |
| Birth order (girls/boys) | 0.009 | 0.39 | 0.002 | 0.08 | | |
| Lower castes | -0.082 | -0.96 | -0.062 | -0.54 | 0.171 | 1.46 |
| Scheduled castes | -0.143 | -1.28 | -0.159 | -1.30 | -0.256 | -1.76 |
| Muslim | -0.022 | -0.26 | -0.130 | -1.32 | 0.346 | 2.45 |
| Time to school | 0.003 | 0.27 | -0.020 | -1.49 | -0.013 | -0.77 |
| Av. school–costs | 0.058 | 0.42 | -0.001 | 0.00 | 0.038 | 0.20 |
| Neighb. school (half) | 0.007 | 0.08 | 0.049 | 0.56 | 0.094 | 0.88 |
| Neighb. school (less) | 0.038 | 0.43 | 0.029 | 0.30 | 0.107 | 0.82 |
| Female workratio | 0.394 | 2.28 | 0.402 | 2.82 | -0.009 | -0.03 |
| Male unemployment | 0.691 | 0.76 | 0.755 | 0.69 | 0.400 | 0.31 |
| Female wages | 0.108 | 2.43 | 0.063 | 1.36 | -0.044 | -0.70 |
| Price (gur/wheat) | -0.042 | -1.84 | 0.098 | 1.72 | -0.055 | -2.43 |
| Value of machines | 0.014 | 3.14 | 0.013 | 3.71 | 0.012 | 1.78 |
| Value of mach. × remote | | | 0.005 | 2.26 | 0.003 | 0.99 |
| Neighb. electrified | 0.142 | 1.90 | 0.141 | 2.04 | 0.095 | 1.07 |
| Constant | 8.416 | 18.13 | 7.735 | 22.88 | 0.094 | 0.22 |
| Nr. of obs. ($N$) | 1067 | | 1318 | | 2198 | |
| Nr. of clusters | 118 | | 119 | | 119 | |
| R–squared (Total) | 0.349 | | 0.286 | | 0.056 | |
| R–sq. (instr. only) | 0.131 | | 0.122 | | | |
| Partial R–sq. of instr. | 0.061 | | 0.069 | | | |
| | $(n,k)$ | F-stat | $(n,k)$ | F-stat | | |
| $F(n,k)$–test of model | $(27,117)$ | 12.34 | $(28,118)$ | 10.74 | | |
| $F(n,k)$–test of instr. | $(3,90)$ | 6.31 | $(4,90)$ | 5.49 | | |

*Notes*: The two first columns show the first stage estimation results for girls and boys in the sample from robust OLS with standard errors clustered on village code and weighted by survey weights. Column (3) shows the results of a (clustered and weighted) probit regression of the presence of family business on the same covariates, performed over the sample of household heads. The variable Price stands for sugar price in columns (1) and (3), and for wheat price in (2).

Table 8: **Trivariate probit results on work/schooling of girls**

| Dependent var. | Market work | | | Domestic work | | | Student | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coeff. | APE | t-st. | Coeff. | APE | t-st. | Coeff. | APE | t-st. |
| Age | 0.203 | 0.034 | 7.12 | 0.173 | 0.055 | 6.38 | -0.247 | -0.068 | -8.90 |
| Married | -0.295 | -0.045 | -1.73 | 0.399 | 0.130 | 2.17 | -0.685 | -0.185 | -2.94 |
| Household income | -1.257 | -0.211 | -3.21 | -1.057 | -0.337 | -3.86 | 1.149 | 0.315 | 3.90 |
| Family business | 0.926 | 0.168 | 3.68 | 0.520 | 0.160 | 3.02 | -0.541 | -0.143 | -2.92 |
| Marginal land | -0.163 | -0.027 | -0.90 | 0.072 | 0.023 | 0.50 | 0.068 | 0.019 | 0.42 |
| Small land | -0.074 | -0.012 | -0.38 | 0.052 | 0.016 | 0.31 | 0.131 | 0.036 | 0.70 |
| Large land | 0.701 | 0.145 | 2.11 | 0.831 | 0.256 | 2.84 | -0.568 | -0.150 | -1.76 |
| Female literacy rate | -0.509 | -0.086 | -1.49 | -0.580 | -0.185 | -2.79 | 0.729 | 0.200 | 3.28 |
| Male literacy rate | 0.403 | 0.068 | 1.77 | -0.225 | -0.072 | -1.29 | 0.350 | 0.096 | 2.10 |
| Educated males | 0.044 | 0.007 | 0.14 | 0.246 | 0.078 | 1.20 | -0.048 | -0.013 | -0.24 |
| Infant share | 0.261 | 0.044 | 1.93 | 0.308 | 0.098 | 2.62 | -0.380 | -0.104 | -3.16 |
| Young share | 0.337 | 0.057 | 1.76 | 0.176 | 0.056 | 1.31 | -0.397 | -0.109 | -2.78 |
| Elderly share | 0.071 | 0.012 | 0.11 | -1.262 | -0.402 | -2.63 | 1.484 | 0.408 | 3.40 |
| Female share | 0.535 | 0.090 | 0.84 | -1.002 | -0.319 | -2.03 | 0.813 | 0.223 | 1.65 |
| Birth order (girls) | 0.032 | 0.005 | 0.51 | -0.115 | -0.037 | -1.97 | 0.160 | 0.044 | 2.51 |
| Lower castes | 0.761 | 0.121 | 2.20 | 0.118 | 0.038 | 0.72 | -0.221 | -0.061 | -1.24 |
| Scheduled castes | 0.869 | 0.166 | 2.46 | 0.059 | 0.019 | 0.30 | -0.194 | -0.054 | -0.89 |
| Muslim | -0.431 | -0.063 | -1.37 | 0.267 | 0.086 | 1.63 | -0.220 | -0.060 | -1.32 |
| Time to school | -0.005 | -0.001 | -0.16 | 0.088 | 0.028 | 3.96 | -0.076 | -0.021 | -2.99 |
| Av. school–costs | 0.400 | 0.067 | 1.24 | 0.083 | 0.026 | 0.45 | -0.421 | -0.116 | -1.82 |
| Neighb. school (half) | -0.004 | -0.001 | -0.02 | 0.144 | 0.046 | 1.08 | -0.352 | -0.097 | -2.59 |
| Neighb. school (less) | 0.094 | 0.016 | 0.59 | 0.243 | 0.078 | 1.57 | -0.382 | -0.104 | -2.65 |
| Female workratio | 2.945 | 0.495 | 6.83 | 0.270 | 0.086 | 0.81 | -0.290 | -0.080 | -0.83 |
| Male unemployment | 4.750 | 0.799 | 1.81 | 4.901 | 1.561 | 3.07 | -2.321 | -0.637 | -1.25 |
| Female wages | 0.262 | 0.044 | 2.47 | 0.121 | 0.039 | 1.61 | -0.071 | -0.019 | -0.82 |
| Resid. income eq. | 1.137 | | 2.68 | 0.854 | | 2.96 | -0.788 | | -2.60 |
| Constant | 3.316 | | 1.05 | 6.200 | | 2.82 | -6.191 | | -2.68 |
| | | | t-st. | | | t-st. | | | t-st. |
| Estimated corr. coeff. | $\rho_{21} = -0.235$ | | -3.29 | $\rho_{31} = -0.111$ | | -1.88 | $\rho_{32} = -0.903$ | | -40.72 |

*Notes*: Estimation results of the trivariate probit model are calculated by SML with 300 pseudorandom draws, clustered on villages and weighted by survey weights. t-statistics refer to the estimated coefficients and are based on robust standard errors. Avarage partial effects (APE) are calculated with respect to the marginal probability of each occupation. Sample size is $N = 1067$ observations. Wald-test of the model $\chi^2(78) = 1344.59,\ p = 0.0000$.

Table 9: **Trivariate probit results on work/schooling of boys**

| Dependent var. | Market work | | | Domestic work | | | Student | | |
|---|---|---|---|---|---|---|---|---|---|
| | Coeff. | APE | t-st. | Coeff. | APE | t-st. | Coeff. | APE | t-st. |
| Age | 0.304 | 0.061 | 10.30 | 0.036 | 0.002 | 1.19 | -0.228 | -0.055 | -8.18 |
| Married | 0.231 | 0.050 | 0.67 | 0.149 | 0.011 | 0.34 | -0.461 | -0.120 | -1.56 |
| Household income | -1.001 | -0.202 | -2.63 | -1.903 | -0.123 | -2.65 | 1.429 | 0.342 | 3.37 |
| Family business | 0.559 | 0.117 | 3.03 | 0.680 | 0.057 | 1.91 | -0.557 | -0.134 | -3.13 |
| Marginal land | 0.100 | 0.020 | 0.69 | 0.014 | 0.001 | 0.06 | 0.197 | 0.047 | 1.51 |
| Small land | 0.214 | 0.044 | 1.23 | 0.825 | 0.073 | 2.89 | -0.224 | -0.054 | -1.21 |
| Large land | 0.671 | 0.158 | 1.91 | 1.381 | 0.197 | 2.63 | -0.368 | -0.093 | -1.09 |
| Female literacy rate | -0.389 | -0.079 | -1.66 | -0.179 | -0.012 | -0.37 | 0.616 | 0.148 | 2.81 |
| Male literacy rate | -0.245 | -0.049 | -1.56 | -0.070 | -0.005 | -0.30 | 0.414 | 0.099 | 3.37 |
| Educated males | -0.014 | -0.003 | -0.07 | -0.758 | -0.049 | -2.66 | 0.371 | 0.089 | 1.99 |
| Infant share | 0.080 | 0.016 | 0.75 | 0.106 | 0.007 | 0.49 | -0.119 | -0.029 | -1.02 |
| Young share | 0.245 | 0.050 | 1.79 | 0.442 | 0.029 | 2.14 | -0.353 | -0.085 | -2.79 |
| Elderly share | -1.271 | -0.257 | -2.50 | -0.731 | -0.047 | -1.38 | 1.245 | 0.298 | 2.77 |
| Female share | 0.089 | 0.018 | 0.21 | -0.996 | -0.064 | -1.36 | 0.618 | 0.148 | 1.55 |
| Birth order (boys) | 0.013 | 0.003 | 0.23 | 0.026 | 0.002 | 0.30 | 0.006 | 0.002 | 0.13 |
| Lower castes | 0.043 | 0.009 | 0.30 | -0.889 | -0.065 | -2.97 | -0.088 | -0.021 | -0.52 |
| Scheduled castes | -0.010 | -0.002 | -0.05 | -0.722 | -0.046 | -2.32 | -0.030 | -0.007 | -0.14 |
| Muslim | 0.172 | 0.036 | 0.80 | -0.740 | -0.031 | -2.48 | -0.191 | -0.047 | -0.92 |
| Time to school | 0.031 | 0.006 | 1.58 | 0.023 | 0.001 | 0.56 | -0.053 | -0.013 | -2.26 |
| Av. school–costs | 0.540 | 0.109 | 2.33 | 0.207 | 0.013 | 0.67 | -0.464 | -0.111 | -1.69 |
| Neighb. school (half) | 0.214 | 0.043 | 1.76 | 0.083 | 0.005 | 0.39 | -0.313 | -0.075 | -2.29 |
| Neighb. school (less) | 0.314 | 0.067 | 2.19 | 0.079 | 0.005 | 0.36 | -0.439 | -0.111 | -3.33 |
| Female workratio | 0.817 | 0.165 | 2.52 | 0.942 | 0.061 | 1.74 | -0.610 | -0.146 | -1.92 |
| Male unemployment | -4.789 | -0.967 | -2.14 | -2.748 | -0.178 | -0.71 | -1.829 | -0.438 | -1.00 |
| Female wages | 0.084 | 0.017 | 1.04 | 0.265 | 0.017 | 1.81 | -0.152 | -0.037 | -1.73 |
| Resid. income eq. | 0.871 | | 2.32 | 1.862 | | 2.55 | -1.257 | | -2.92 |
| Constant | 2.360 | | 0.73 | 13.583 | | 2.25 | -7.812 | | -2.24 |
| | | | t-st. | | | t-st. | | | t-st. |
| Estimated corr. coeff. | $\rho_{21} = -0.155$ | | -1.65 | $\rho_{31} = -0.840$ | | -32.56 | $\rho_{32} = -0.293$ | | -3.33 |

*Notes*: Estimation results of the trivariate probit model are calculated by SML with 300 pseudorandom draws, clustered on villages and weighted by survey weights. t-statistics refer to the estimated coefficients and are based on robust standard errors. Avarage partial effects (APE) are calculated with respect to the marginal probability of each occupation. Sample size is N=1318 observations. Wald-test of the model $\chi^2(78) = 2052.59,\ p = 0.0000$.

Table 10: **APEs on trivariate probabilities of work/idleness of girls**

| Outcome | Work, no school | | | | | | Idle | |
|---|---|---|---|---|---|---|---|---|
| | Market only | | Domestic only | | Combine M&D | | Do nothing | |
| | APE | t-st. | APE | t-st. | APE | t-st. | APE | t-st. |
| Age | 0.007 | 3.60 | 0.030 | 4.77 | 0.026 | 8.37 | -0.006 | -2.51 |
| Married | -0.011 | -1.20 | 0.150 | 2.63 | -0.004 | -0.32 | 0.024 | 1.10 |
| Household income | -0.034 | -2.08 | -0.165 | -2.37 | -0.138 | -4.07 | 0.070 | 2.72 |
| Family business | 0.024 | 2.20 | 0.036 | 0.84 | 0.108 | 3.63 | -0.046 | -2.95 |
| Marginal land | -0.010 | -1.05 | 0.016 | 0.45 | -0.010 | -0.63 | -0.013 | -0.79 |
| Small land | -0.007 | -0.85 | 0.001 | 0.01 | -0.005 | -0.23 | -0.020 | -1.06 |
| Large land | -0.001 | 0.00 | 0.080 | 1.06 | 0.123 | 2.23 | -0.075 | -4.43 |
| Female literacy rate | -0.014 | -1.08 | -0.112 | -2.27 | -0.063 | -2.23 | 0.020 | 1.01 |
| Male literacy rate | 0.015 | 1.27 | -0.093 | -2.17 | 0.018 | 1.16 | -0.022 | -1.40 |
| Educated males | -0.006 | -0.42 | 0.038 | 0.65 | 0.012 | 0.60 | -0.033 | -1.74 |
| Infant share | 0.007 | 1.15 | 0.060 | 2.30 | 0.033 | 2.81 | -0.011 | -0.88 |
| Young share | 0.015 | 1.79 | 0.036 | 1.11 | 0.034 | 2.32 | 0.007 | 0.47 |
| Elderly share | 0.014 | 0.40 | -0.321 | -2.75 | -0.051 | -1.16 | 0.013 | 0.20 |
| Female share | 0.037 | 1.25 | -0.258 | -1.92 | -0.003 | -0.12 | 0.035 | 0.86 |
| Birth order (girls) | 0.002 | 0.49 | -0.032 | -2.39 | -0.003 | -0.75 | -0.003 | -0.51 |
| Lower castes | 0.027 | 2.22 | -0.016 | -0.40 | 0.058 | 2.45 | -0.018 | -1.30 |
| Scheduled castes | 0.037 | 2.14 | -0.046 | -0.93 | 0.076 | 2.30 | -0.021 | -1.22 |
| Muslim | -0.017 | -1.30 | 0.091 | 1.91 | -0.020 | -0.93 | -0.003 | -0.19 |
| Time to school | -0.002 | -1.19 | 0.020 | 3.68 | 0.003 | 1.46 | -0.004 | -1.85 |
| Av. school–costs | 0.021 | 1.58 | 0.020 | 0.33 | 0.035 | 1.50 | 0.022 | 1.06 |
| Neighb. school (half) | 0.003 | 0.34 | 0.052 | 1.62 | 0.008 | 0.58 | 0.019 | 1.48 |
| Neighb. school (less) | 0.003 | 0.44 | 0.063 | 1.81 | 0.019 | 1.36 | 0.003 | 0.21 |
| Female workratio | 0.105 | 5.15 | -0.148 | -2.14 | 0.225 | 5.92 | -0.115 | -3.62 |
| Male unemployment | 0.052 | 0.51 | 0.585 | 1.38 | 0.536 | 2.59 | -0.634 | -3.18 |
| Female wages | 0.007 | 1.44 | 0.005 | 0.22 | 0.024 | 2.87 | -0.019 | -2.22 |
| Predicted prob. | 0.035 | | 0.309 | | 0.061 | | 0.119 | |
| Sample share | 0.068 | | 0.369 | | 0.043 | | 0.060 | |

*Notes*: Estimation results are based on the trivariate probit model. The avarage partial effects (APE) are calculated with respect to the joint trivariate probability of each outcome. Market only refers to the outcome $P(L = 1, H = 0, S = 0)$, Domestic only to $P(L = 0, H = 1, S = 0)$, Combine M&D to $P(L = 1, H = 1, S = 0)$, Do nothing to $P(L = 0, H = 0, S = 0)$. t-statistics are based on standard errors approximated by an empirical Bayes procedure. Sample size is $N = 1067$ observations.

Table 11: **APEs on trivariate probabilities of work and school of girls**

| Outcome | School only | | Combine school with Market work | | Domestic work | |
|---|---|---|---|---|---|---|
| | APE | t-st. | APE | t-st. | APE | t-st. |
| Age | -0.058 | -10.77 | 0.003 | 1.48 | -0.003 | -1.61 |
| Married | -0.114 | -2.76 | -0.026 | -3.49 | -0.014 | -0.90 |
| Household income | 0.324 | 4.95 | -0.029 | -1.26 | -0.017 | -0.81 |
| Family business | -0.162 | -4.41 | 0.027 | 1.93 | 0.004 | 0.24 |
| Marginal land | 0.007 | 0.21 | -0.007 | -0.72 | 0.016 | 1.04 |
| Small land | 0.012 | 0.28 | -0.001 | -0.08 | 0.019 | 1.10 |
| Large land | -0.184 | -3.64 | 0.007 | 0.42 | 0.033 | 1.21 |
| Female literacy rate | 0.180 | 3.22 | -0.004 | -0.21 | -0.002 | -0.09 |
| Male literacy rate | 0.047 | 1.36 | 0.031 | 2.21 | 0.000 | -0.01 |
| Educated males | -0.037 | -0.85 | -0.001 | -0.05 | 0.025 | 1.51 |
| Infant share | -0.094 | -3.48 | 0.002 | 0.21 | 0.002 | 0.16 |
| Young share | -0.084 | -2.82 | 0.007 | 0.64 | -0.016 | -1.44 |
| Elderly share | 0.319 | 3.49 | 0.049 | 1.33 | -0.023 | -0.41 |
| Female share | 0.186 | 1.70 | 0.055 | 1.41 | -0.054 | -1.45 |
| Birth order (girls) | 0.031 | 2.30 | 0.007 | 1.53 | -0.001 | -0.12 |
| Lower castes | -0.076 | -1.75 | 0.030 | 2.01 | -0.011 | -0.96 |
| Scheduled castes | -0.080 | -1.69 | 0.046 | 1.93 | -0.018 | -1.24 |
| Muslim | -0.041 | -1.23 | -0.023 | -2.00 | 0.016 | 0.79 |
| Time to school | -0.019 | -3.37 | -0.003 | -1.75 | 0.004 | 2.04 |
| Av. school–costs | -0.079 | -1.69 | 0.010 | 0.57 | -0.030 | -1.90 |
| Neighb. school (half) | -0.058 | -1.95 | -0.009 | -1.06 | -0.013 | -1.19 |
| Neighb. school (less) | -0.077 | -2.38 | -0.006 | -0.81 | -0.006 | -0.49 |
| Female workratio | -0.217 | -2.74 | 0.142 | 5.50 | -0.016 | -0.80 |
| Male unemployment | -1.098 | -2.90 | 0.145 | 0.95 | 0.347 | 2.84 |
| Female wages | -0.036 | -2.05 | 0.011 | 1.75 | 0.006 | 0.81 |
| Predicted prob. | 0.356 | | 0.038 | | 0.079 | |
| Sample share | 0.426 | | 0.010 | | 0.019 | |

*Notes*: Estimation results are based on the trivariate probit model. The avarage partial effects (APE) are calculated with respect to the joint trivariate probability of each outcome. School only refers to the outcome $P(L = 0, H = 0, S = 1)$, Combine school with market work to $P(L = 1, H = 0, S = 1)$, combine school with domestic work to $P(L = 0, H = 1, S = 1)$. t-statistics are based on standard errors approximated by an empirical Bayes procedure. Sample size is $N = 1067$ observations.

Table 12: **APEs on trivariate probabilities of work/idleness of boys**

| Outcome | Work, no school | | | | Idle | |
|---|---|---|---|---|---|---|
| | Market only | | Domestic only | | Do nothing | |
| | APE | t-st. | APE | t-st. | APE | t-st. |
| Age | 0.047 | 10.10 | 0.0003 | 0.46 | -0.001 | -0.32 |
| Married | 0.048 | 0.85 | 0.006 | 0.61 | 0.044 | 0.86 |
| Household income | -0.150 | -2.49 | -0.044 | -2.61 | -0.076 | -1.21 |
| Family business | 0.074 | 2.39 | 0.017 | 1.60 | 0.005 | 0.17 |
| Marginal land | 0.001 | 0.05 | -0.002 | -0.42 | -0.041 | -2.44 |
| Small land | 0.018 | 0.62 | 0.022 | 2.17 | -0.011 | -0.47 |
| Large land | 0.041 | 0.63 | 0.041 | 1.48 | -0.069 | -2.11 |
| Female literacy rate | -0.068 | -2.12 | -0.006 | -0.63 | -0.051 | -1.95 |
| Male literacy rate | -0.045 | -2.13 | -0.003 | -0.63 | -0.037 | -2.13 |
| Educated males | -0.009 | -0.29 | -0.018 | -2.61 | -0.041 | -1.73 |
| Infant share | 0.013 | 0.75 | 0.003 | 0.56 | 0.008 | 0.54 |
| Young share | 0.037 | 1.99 | 0.010 | 2.26 | 0.020 | 0.96 |
| Elderly share | -0.185 | -2.78 | -0.017 | -1.28 | -0.043 | -0.66 |
| Female share | -0.006 | -0.04 | -0.026 | -1.68 | -0.086 | -1.68 |
| Birth order (boys) | 0.001 | 0.11 | 0.000 | 0.25 | -0.003 | -0.52 |
| Lower castes | 0.021 | 1.16 | -0.019 | -2.11 | 0.028 | 1.57 |
| Scheduled castes | 0.010 | 0.39 | -0.014 | -1.92 | 0.020 | 0.88 |
| Muslim | 0.036 | 1.12 | -0.010 | -2.62 | 0.021 | 0.95 |
| Time to school | 0.006 | 2.02 | 0.001 | 0.83 | 0.004 | 1.36 |
| Av. school–costs | 0.077 | 2.28 | 0.004 | 0.68 | 0.010 | 0.33 |
| Neighb. school (half) | 0.037 | 2.23 | 0.003 | 0.63 | 0.024 | 1.44 |
| Neighb. school (less) | 0.057 | 2.61 | 0.003 | 0.68 | 0.032 | 1.70 |
| Female workratio | 0.104 | 2.23 | 0.019 | 1.52 | -0.012 | -0.39 |
| Male unemployment | -0.395 | -1.34 | -0.009 | -0.06 | 0.857 | 3.73 |
| Female wages | 0.013 | 1.10 | 0.006 | 1.69 | 0.009 | 0.94 |
| Predicted prob. | 0.129 | | 0.012 | | 0.155 | |
| Sample share | 0.159 | | 0.024 | | 0.093 | |

*Notes*: Estimation results are based on the trivariate probit model. The avarage partial effects (APE) are calculated with respect to the joint trivariate probability of each outcome. Market only refers to the outcome $P(L = 1, H = 0, S = 0)$, Domestic only to $P(L = 0, H = 1, S = 0)$, Do nothing to $P(L = 0, H = 0, S = 0)$. t-statistics are based on standard errors approximated by an empirical Bayes procedure. Sample size is $N = 1318$ observations.

Table 13: **APEs on trivariate probabilities of work and school of boys**

| Outcome | School only | | Combine school with Market work | | Domestic work | |
|---|---|---|---|---|---|---|
| | APE | t-st. | APE | t-st. | APE | t-st. |
| Age | -0.066 | -11.59 | 0.017 | 8.32 | -0.001 | -1.49 |
| Married | -0.100 | -1.82 | -0.003 | 0.00 | 0.000 | 0.26 |
| Household income | 0.369 | 4.19 | -0.017 | -0.57 | -0.046 | -1.79 |
| Family business | -0.157 | -4.11 | 0.020 | 1.36 | 0.017 | 1.15 |
| Marginal land | 0.021 | 0.62 | 0.018 | 1.66 | 0.002 | 0.27 |
| Small land | -0.087 | -2.25 | 0.006 | 0.39 | 0.031 | 1.83 |
| Large land | -0.208 | -2.62 | 0.038 | 1.13 | 0.078 | 1.44 |
| Female literacy rate | 0.135 | 2.33 | -0.005 | -0.33 | 0.000 | -0.05 |
| Male literacy rate | 0.088 | 3.05 | -0.002 | -0.13 | 0.002 | 0.27 |
| Educated males | 0.083 | 1.96 | 0.017 | 1.27 | -0.021 | -2.18 |
| Infant share | -0.029 | -0.98 | 0.001 | 0.16 | 0.002 | 0.31 |
| Young share | -0.090 | -3.28 | 0.004 | 0.39 | 0.011 | 1.49 |
| Elderly share | 0.327 | 3.30 | -0.051 | -1.26 | -0.011 | -0.58 |
| Female share | 0.120 | 1.27 | 0.038 | 1.43 | -0.026 | -1.07 |
| Birth order (boys) | -0.001 | -0.13 | 0.001 | 0.37 | 0.001 | 0.38 |
| Lower castes | 0.016 | 0.49 | 0.001 | 0.12 | -0.034 | -2.38 |
| Scheduled castes | 0.018 | 0.41 | -0.001 | -0.06 | -0.022 | -2.11 |
| Muslim | -0.032 | -0.62 | 0.007 | 0.52 | -0.015 | -2.98 |
| Time to school | -0.012 | -2.53 | 0.0002 | 0.10 | 0.000 | 0.09 |
| Av. school–costs | -0.125 | -2.01 | 0.025 | 1.81 | 0.002 | 0.25 |
| Neighb. school (half) | -0.070 | -2.17 | 0.004 | 0.41 | 0.000 | -0.10 |
| Neighb. school (less) | -0.101 | -3.19 | 0.006 | 0.61 | -0.002 | -0.21 |
| Female workratio | -0.195 | -2.81 | 0.041 | 1.72 | 0.023 | 1.32 |
| Male unemployment | 0.213 | 0.52 | -0.494 | -3.11 | -0.094 | -0.79 |
| Female wages | -0.039 | -2.00 | -0.0002 | -0.06 | 0.007 | 1.48 |
| Predicted prob. | 0.634 | | 0.047 | | 0.016 | |
| Sample share | 0.678 | | 0.029 | | 0.011 | |

*Notes*: Estimation results are based on the trivariate probit model. The avarage partial effects (APE) are calculated with respect to the joint trivariate probability of each outcome. School only refers to the outcome $P(L = 0, H = 0, S = 1)$, Combine school with market work to $P(L = 1, H = 0, S = 1)$, combine school with domestic work to $P(L = 0, H = 1, S = 1)$. t-statistics are based on standard errors approximated by an empirical Bayes procedure. Sample size is $N = 1318$ observations.