

# **Determinants Of Child Farm Labour In Ghana And Pakistan: A Comparative Study**

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## **Abstract**

This paper investigates the determinants of child labour on family farms in Ghana and Pakistan on the basis that a comparative perspective offers useful insights. The estimates identify a powerful negative effect of living standards on the work of Pakistani boys. However, for girls in Pakistan as well as for boys and girls in Ghana, household income has no significant impact on work. These results are obtained after instrumenting income, and we may expect to find even weaker income effects in the presence of simultaneity bias. The size of the farm and of the family impact upon child work in Pakistan more than in Ghana, a result that is consistent with population density being greater in Pakistan. A very powerful effect on child work arises from mothers' education. This effect is larger for boys than for girls, and it is larger in Pakistan than in Ghana.

**Keywords:** child labour, poverty, female education, Ghana, Pakistan

**JEL Classification:** J22, O15

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# **Determinants Of Child Farm Labour In Ghana And Pakistan:**

## **A Comparative Study**

*Sonia Bhalotra and Chris Heady*

### **1. Introduction\***

This paper presents an analysis of the determinants of child labour on the household farm in rural Pakistan and Ghana. In both countries, approximately a third of boys and girls aged 10-14 are engaged in farm work. In Ghana, this is the only form of child employment, whereas in Pakistan, a further 9% of children in this age group are engaged in wage labour on the “open market”.

Comparative work is a first step in gaining an insight into the universality of the problem of child work. South Asia and Sub-Saharan Africa are clearly very different environments, their common ground being that the average household, at least in rural areas, is poor. While South Asia has the largest number of working children, Sub-Saharan Africa has the highest incidence of child labour. The vast majority of working children in developing countries including Pakistan and Ghana are engaged in agricultural work. However, this work is severely understudied as compared with the more visible forms of work in Latin America and Asia which involve children in labour-intensive manufacturing. Yet, working with the family on the farm, to the extent that it conflicts with school attendance, may be a symptom of intergenerational immobility in occupation and, associated, of the perpetuation of poverty. On the other hand, since parents are likely to be the least exacting of employers, this form of child work may, at first glance, appear to be no worse than good exercise and practical training. Which of these representations is closer to the truth? The answer depends upon the hours spent in such work and the extent to which it

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conflicts with school. It also depends upon the degree to which child work on the farm appears to be a choice rather than a function of household poverty or poor school access. This paper explores large and rich data sets for two countries in a comparative light with a view to throwing some light on these questions.

The data we use are large household surveys of living standards conducted by the World Bank in collaboration with the country governments in the early 1990s. Existing beliefs about the causes and consequences of child labour have tended to be shaped by case studies. These typically interview working children. An advantage of using large scale representative household surveys is that we have comparable information for children who do not work. In contrast to the majority of other reduced form analyses of child work, we utilise data on hours of work rather than restrict our analysis to participation. This paper also differs from most existing analyses in taking account of the simultaneity of child work and household living standards. A comparison of estimates with and without instrumental variables on our data underline the importance of IV.

The paper is organised as follows. Section 2 outlines some of the contributions of this paper in the context of the existing literature. Section 3 presents a descriptive analysis of the extent and nature of child labour in Ghana and Pakistan and its effects on education. Section 4 provides the theoretical background by setting out a simple static model of labour supply, followed by a more complex model that takes account of the effects of child work and schooling on future earnings. An empirical specification is discussed in Section 5 and Tobit estimates of a reduced form equation for hours of child work are presented in Section 6. In Section 7, we present tentative policy conclusions.

## **2. The Literature and Contributions of this Paper**

There is a rapidly growing literature on child labour but, as Basu (1999) points out in his survey, empirical work in this field is deficient. A variety of results has emerged, corresponding to the vast variety of regions, types of child work, and empirical specifications involved.

It is not uncommon for analysts to pool data for boys and girls or for the rural and urban regions of a country, and to aggregate across different types of work (e.g., Patrinos and Psacharopoulos (1997), Ray (2000)). Since the implied slope restrictions are typically not tested but are unlikely to hold, we restrict attention to work on the family farm in rural areas and separate samples by gender. In a departure from the literature, we select in to our samples only those households that own or operate land. It is only in such households that working on the family farm is a choice! Neglecting to select out the landless households would bias the coefficient on farm size. Indeed, our investigation of this showed that every other variable in the equation was wiped out by the stunning explanatory power of farm size if this variable was allowed to take on the value of zero.

Existing work has tended to concentrate on the participation decision. However, the data on hours of work of children exhibit substantial variation, with many children working less than 10 hours a week. From a policy perspective, participation at 10 hours a week is rather different from participation at 40 hours a week. We therefore utilise the information on work hours by estimating tobit models.

Several authors have introduced household income into a reduced form description of child work without taking account of the feedback effect from child work to household income, even though the contribution of children is acknowledged to be substantial (e.g. Psacharopoulos (1997), Patrinos and Psacharopoulos (1997), Kassouf (1998), Canagarajah and Coulombe (1998), Kanbargi and Kulkarni (1995), Grootaert (1998)<sup>1</sup>). The empirical

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<sup>1</sup> Grootaert (1998) acknowledges that income (or expenditure) is likely to be endogenous and argues that this is dealt with in his analysis of child labour in the Cote d'Ivoire by replacing income with a dummy for whether or not the household falls into the lowest income quantile. In fact, this dummy is of course endogenous as well- the author does not solve the problem by

results are mixed, with a tendency to exhibit no significant relation between household income and child participation in work. This may be the result of misspecification of the equation or of measurement error in income. This paper instruments household income using community-level variables.

It has been argued that children from larger households are more likely to work, as a consequence of resources per person being smaller in larger households (e.g. Patrinos and Psacharopoulos, 1997). However, we would not expect this association to persist after controlling for household income per equivalent adult. An alternative basis for positing a correlation of household size and child labour is that fertility may be encouraged by the prospects for child work (e.g. Rosenzweig and Evenson (1977), Cain (1977), Singh and Schuh (1986), Eswaran (1996), Bardhan and Udry (1999)). In this case, it may be argued that household size is endogenous in the child hours model. However, since changes in household size tend to take a long time to happen, it does not seem unreasonable to treat this variable as if it were exogenous to the child work decision<sup>2</sup>. Since size and composition are clearly correlated, the relation between household size and child work will also depend upon whether household composition is held constant. Jensen and Nielsen (1996) and Psacharopoulos (1997), for example, include assets and size but not composition of the household. Kassouf (1998), Jensen (1999), Canagarajah and Coulombe (1998), Grootaert (1998) and Patrinos and Psacharopoulos (1997) include income (assumed exogenous) and composition, but size does not appear independently. For the work of family members on the household farm, hours of work will tend to be increasing in land size until such time that land is so abundant that the household rents it out (e.g. Sharif, 1994). Controlling for land size, we may expect child hours of work to be decreasing in household size because of diminishing returns. The empirical results support some variety (see Cochrane, Kozel and Alderman, 1990) but there is

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throwing away information on income.

<sup>2</sup> There are pragmatic reasons for this as well. It is extremely difficult to find an instrument for household size. We do not know of any study that has found one.

a tendency to find a positive association of household size and child work<sup>3</sup>. Few analyses of rural work control for land size (e.g., Kassouf, 1998). In this paper, we include (endogenous) income, household size and comprehensive indices of household composition. We also control for land size and for the mode of operation of the land (such as whether it is rented or sharecropped<sup>4</sup>).

### **3. The Extent and Apparent Effects of Child Labour**

This section presents empirical evidence on the prevalence, intensity, and nature of child labour in rural areas, together with some evidence of the correlation of child labour with school attendance.

#### **The Data**

The data are drawn from the Ghana Living Standards Survey (GLSS) for 1991/2 (wave 3) and the Pakistan Integrated Household Survey (PIHS) for 1991. The GLSS contains 4552 households, with an average household size of 4.5 members, giving a total of 20403 individuals. Almost 50 per cent of males and 45 per cent of females are aged under 15. The Pakistan Integrated Household Survey for 1991 contains 4795 households. On account of a much larger mean household size of 7.5 members, we have a sample of 36,109 individuals. About 43.5% of males and 45.5% of females in the sample are aged under 15. The GLSS collects data on employment for persons 7 years or older whereas the cut-off is at the age of 10 in the PIHS. While there are important differences in the two datasets, their structure and coverage are sufficiently similar to allow some interesting cross-national comparisons.

Participation rates in school and in different kinds of work for *the sample of rural children whose households own or operate agricultural land* are in Tables 1-6 for 7-17 year olds organised into three age groupings. Data on 15-17 year olds is of interest in so far as it

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<sup>3</sup> King (1987) reviews the literature on the association of large family size with adverse welfare outcomes for children including health and educational attainment.

<sup>4</sup> One rationalisation of the benefits to the landlord from pursuing sharecropping instead of renting the land out or hiring wage labour in, is that it improves the landlord's access to labour by making available the labour of the tenant's family in addition to the labour of the

illustrates how the school and work patterns of under-15s evolve with age. The discussion that follows refers to *10-14 year olds*.

### **School Attendance**

In rural Ghana, 78% of boys and 71% of girls aged 10-14 years are “currently in school”. In contrast, *school attendance* in Pakistan is remarkably larger for boys as compared to girls of all ages. Amongst 10-14 year olds, 72% of boys and 26% of girls are in school. Except for girls in Pakistan who appear to withdraw into the household at an early age, school participation is lower in the 7-9 and 15-17 year ranges suggesting late entry and early exit (the latter, especially for girls).

### **Child Participation in Work**

In Ghana, about 52% of boys and 48% of girls undertake *work on the household farm*, a further 3% of each gender are engaged in *household enterprises*, and less than 1% report any *employment outside the household*. In Pakistan, 32% of boys and 39% of girls work on the household farm, less than 1% of both genders work in a household enterprise, and 4.3% of boys and 12% of girls work outside the home. Data on *domestic work*, which includes fetching firewood or water, cooking, cleaning, laundry, shopping and child care, were collected for boys and girls in Ghana and for girls alone in Pakistan. Tables 1, 2 and 4 show that virtually all children participate in domestic work of some sort. In addition (not shown in the Tables), about 5% of Pakistani girls engage in home work for sales, an activity in which boys have no part. For boys and girls, participation in all sorts of work tends to increase steadily with age.

The striking difference between the two countries is that a significant fraction of children in Pakistan are engaged in work outside the household. The data show that this is more or less full-time work<sup>5</sup> and that, for girls, it is predominantly seasonal agricultural

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tenant.

<sup>5</sup> The wage economy is better developed in Pakistan, possibly on account of the relative scarcity of land in South Asia as compared with Sub-Saharan Africa. Therefore, for adults and children alike, wage employment presents productive opportunities where the returns to self employment are relatively limited. Child work outside the home in Pakistan is analysed

work, whereas the large fraction of boys who work outside the home are engaged in non-agricultural work<sup>6</sup>. Since outside employment is close to zero for Ghanaian children, we concentrate in this paper on farm work which employs by far the largest proportion of children in both countries and which is comparable across them.

### **Hours of Child Work**

How hard do farm-working children work? See Table 5. Work intensity is similar among girls and boys in Ghana, the mean hours conditional on working being 17 for boys and 16 for girls.<sup>7</sup> This is not dissimilar to the figure for Pakistani girls, which is 14 hours a week. Boys in Pakistan work harder, doing 23 hours a week on average. Mean hours increase with age for all groups other than for Pakistani girls who exhibit lower work intensity in the 15-17 age group. Table 5 shows that there is a wide dispersion around these means, and that it is therefore important to explain the variation in hours of child work.

### **Combining School and Work**

Tables 6 shows that, of Ghanaian children who work on the household farm, three in four boys and two in three girls are at the same time in school. Table 7 shows that in Pakistan, this is true of one in two boys. Girls in Pakistan are in a class apart, as only one in ten of those who work on the farm attends school. It would appear, therefore, that combining farmwork and school is considerably easier in Ghana than in Pakistan and that it is especially difficult (or not preferred) for Pakistani girls.<sup>8</sup>

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in Bhalotra (1999).

<sup>6</sup> The seasonality of girls' outside work is consistent with their average hours of work being lower than those of boys in rural Pakistan. The non-agricultural work of boys may include work in rural manufacturing enterprises as well as work in the services- helping at the post office, waiting at a local tea shop, etc. Other than providing hours and wage information, the data do not throw any further light on the nature of their work.

<sup>7</sup> For all types of work except housework, this refers to the answer to the question : "how many hours per week did you normally work?" Only 5 children reported working at more than one occupation at the same time, so secondary work was ignored in the interests of simplicity. Individuals may be engaged in housework as well as the main occupation.

<sup>8</sup> The correlation of school attendance (a binary variable for the individual) with work-participation and hours of work was examined for 7-17 year olds, holding constant age, household size, current household expenditure per capita, and all cluster-specific effects. The conditional correlation of work participation with school participation in Ghana is positive but increasing hours of work did appear to reduce the probability of school attendance. In

However, in both countries, a substantial proportion of children neither work nor go to school. In Pakistan, this is 35% of girls and 10% of boys and in Ghana, it is 14% girls and 8% boys. Notice that in both countries, this fraction is especially large among girls. Therefore, if the main concern is with low educational attainment (and the gender gap therein), then *policies designed to discourage child labour may be rather less important than policies that directly promote school attendance.*

#### **4. The Theoretical Specification**

The purpose of this section is to provide a theoretical basis for the empirical specification discussed in section 5, and to assist in the interpretation of the empirical results presented in section 6. We start by setting out a simple static model of labour supply and then specify a more complex dynamic model to capture the effects of work and schooling on future earnings.

##### **4.1. A Simple Static Model of Labour Supply**

This section follows Killingsworth (1983). In this paper, we neglect questions of household decision making and assume a unitary model. Let the utility function be

$$U = U(X, H; Z, e) \tag{1}$$

where  $X$  is consumption,  $H$  is hours of work,  $Z$  is a vector of observables correlated with tastes and  $e$  is a stochastic element that denotes unobservables. The reservation wage,  $W^*$  is the shadow price of leisure and is therefore equal to the marginal rate of substitution when  $H=0$ :

$$W^* = W^*(P, Y; Z, e) \tag{2}$$

where  $Y$  is nonlabour income (which, in this context, is the net contribution that the rest of the household is prepared to make to the child's consumption - a contribution that will depend on several factors including household income and characteristics of the child such as

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Pakistan, both participation and hours of child work are negatively correlated with school attendance (results available from the authors on request).

age, sex and birth order) and  $P$  is a price index for the composite consumption good. If the market wage,  $W$ , exceeds the reservation wage, then the individual will participate. Given an interior solution, the optimal hours of work must satisfy the condition that the real wage equals the marginal rate of substitution,  $m$  :

$$\frac{W}{P} = -m(X, H; Z, e) = -\frac{\partial U / \partial H}{\partial U / \partial X} \quad (3)$$

Solving (3) simultaneously with the budget constraint,  $PX = WH + Y$ , gives the equations determining desired consumption and hours of work. We restrict our interest to the latter:

$$H^* = H^*(P, W, Y; Z, e) \quad (4)$$

Clearly, participation and hours of work are inextricably linked, and depend upon the same exogenous variables:

$$H = H^*(P, W, Y; Z, e) \text{ if } W > W^*(P, Y; Z, e) \quad (5)$$

and  $H = 0$  otherwise.

Since the majority of children report zero hours of work, least squares estimates of (5) will be biased. We therefore use the tobit specification, which jointly models the participation and hours decisions. The Tobit likelihood function is

$$l = \prod_{i \in E} f(\varepsilon_{Hi} / \sigma_H) / \sigma_H \prod_{i \in NE} F(-J_i / \sigma_H) \quad (6)$$

where  $\varepsilon_{Hi}$  is an estimate of  $e$ , assumed to be normally distributed with mean zero and variance  $\sigma_H^2$  and  $J$  is a shorthand for the predicted value of hours, which depends upon the coefficients,  $\beta$ . The parameters  $\beta$  and  $\sigma_H$  are estimated by maximising the log of (6) with respect to these parameters.

#### **4.2 A Dynamic Model of Labour Supply and Schooling**

The static model provides a useful starting point which illustrates the principles of the work-leisure choice and motivates the Tobit specification. In this section, this is developed to consider the choice between schooling, work and leisure in an intertemporal setting in which the individual is maximising lifetime utility. Current decisions on hours of

school and work influence future wage rates (W) through two variables, work experience (E) and educational capital (K).

Similar models are set out in Blinder and Weiss (1976), Driffill (1980) and Killingsworth (1982). The general characteristics of this kind of model are discussed in Killingsworth (1983, Chapter 5, Sections 5 and 6). However, this model is different in two significant respects: (i) It distinguishes between educational capital and work experience, allowing them to be less than perfect substitutes and allowing them different rates of depreciation; and (ii) it permits different assumptions about households' abilities to borrow and lend on the capital market, rather than simply assuming a perfect capital market.

It is assumed that the work and schooling choices are made by the household to maximise the child's lifetime utility, subject to the resources that the household has decided to devote to the child. The child's instantaneous utility function is given by:

$$U(X_t, S_t, H_t, t; Z) \quad (7)$$

where Z represent (constant) characteristics of the child and the household, t represents the child's age (and in subscript, the current time period), S is hours spent at school and, as before, X is the child's consumption, and H is hours of child work.

Suppose that the child receives a (positive or negative) transfer from the rest of the household (Y, referred to in the static model as "nonlabour income"), which may vary through time and will depend on the household's income and financial commitments and the child's characteristics. Then the instantaneous budget constraint facing the child is given by:

$$P_t \cdot X_t \leq Y_t + W_t \cdot H_t - C(S_t, t) \quad (8)$$

It is implicit in this writing of a constraint for the individual child that their work hours will depend not only upon their wage rate (W) but also upon the cost of schooling (C), the cost and quantity of their consumption (P and X), and what their parents are willing to bestow upon them (Y).

It is not necessary to have a time constraint that limits school hours plus work hours. A fixed limit is unrealistic, as children could vary their leisure time, and the total of H+S will

be prevented from exceeding physiological limits by increasing marginal disutility in the utility function.

The wage rate is assumed to vary with work experience, educational capital and age:

$$W_t = W(E_t, K_t, t) \quad (9)$$

Of course, children that work in a family farm or business do not receive an explicit wage. In such a case, the wage should be interpreted as the marginal contribution of extra child time devoted to that activity. The evolution of the work experience and educational capital variables is governed by current work and schooling, by depreciation of the respective stocks and by age (t):

$$\dot{E} = f(H_t, E_t, t) \quad (10)$$

$$\dot{K} = g(S_t, K_t, t) \quad (11)$$

where dots over variables indicate their time derivatives. The Lagrangean for this problem is:

$$L = \int_{t=0}^T U(X_t, S_t, H_t, t) \cdot dt + \int_{t=0}^T \lambda_t \cdot [Y_t + W(E_t, K_t, t) \cdot H_t - C(S_t, t) - P_t X_t] \cdot dt \\ + \int_{t=0}^T \gamma_t \cdot [f(H_t, E_t, t) - \dot{E}] \cdot dt + \int_{t=0}^T \theta_t \cdot [g(S_t, K_t, t) - \dot{K}] \cdot dt$$

where T is the length of life.

The first-order conditions are:

$$\frac{\partial L}{\partial X_t} = \frac{\partial U}{\partial X_t} - \lambda_t \cdot P_t = 0 \quad (12)$$

$$\frac{\partial L}{\partial S_t} = \frac{\partial U}{\partial S_t} - \lambda_t \cdot \frac{\partial C}{\partial S_t} + \theta_t \cdot \frac{\partial g}{\partial S_t} \leq 0 \quad (= \text{if } S_t > 0) \quad (13)$$

$$\frac{\partial L}{\partial H_t} = \frac{\partial U}{\partial H_t} + \lambda_t \cdot W_t + \gamma_t \cdot \frac{\partial f}{\partial H_t} \leq 0 \quad (= \text{if } H_t > 0) \quad (14)$$

$$\frac{\partial L}{\partial E_t} - \frac{d}{dt} \frac{\partial L}{\partial \dot{E}} = \lambda_t \cdot \frac{\partial W}{\partial E_t} \cdot H_t + \gamma_t \cdot \frac{\partial f}{\partial E_t} + \dot{\gamma} = 0 \quad (15)$$

$$\frac{\partial L}{\partial K_t} - \frac{d}{dt} \frac{\partial L}{\partial \dot{K}} = \lambda_t \cdot \frac{\partial W}{\partial K_t} \cdot H_t + \theta_t \cdot \frac{\partial g}{\partial K_t} + \dot{\theta} = 0 \quad (16)$$

These first-order conditions do not include a condition for the choice of  $Y$ , the transfer from the family to the child. This is because the extent of choice available to the family will depend on their circumstances and their access to capital markets. However, it is worth noting that if the capital market were perfect, with an interest rate  $r$ , it would be sensible to allow a free choice of  $Y$  subject to a limit on its present value. This would give the following standard condition for the evolution of  $\lambda$ :

$$\dot{\lambda} = -r \lambda_t \quad (17)$$

Finally, the transversality conditions are that the terminal values on the accumulation of educational capital and experience should be zero:

$$\theta_T = \gamma_T = 0 \quad (18)$$

### **4.3 Analysis**

There are four possible states that a child could be in at any one time (see Tables 6 and 7):

- (A) Only school
- (B) School and work
- (C) Only work
- (D) Neither school nor work

In state A, the weak inequality in (13) becomes an equality. The combination of that with (14) produces:

$$\left\{ \frac{\partial U}{\partial H_t} - \frac{\partial U}{\partial S_t} \right\} + \lambda_t \cdot \left\{ W_t + \frac{\partial C}{\partial S_t} \right\} \leq \theta_t \cdot \frac{\partial g}{\partial S_t} - \gamma_t \cdot \frac{\partial f}{\partial H_t} \quad (19)$$

In state B, the weak inequalities in (13) and (14) become equalities, and so the inequality in (19) is replaced by an equality. In state C, the inequality in (14) is replaced by

an equality, and so the inequality in (14) is reversed.

The intuition behind these results is straightforward. Condition (19) compares the costs and benefits of switching the last hour of non-leisure time between school and work. The contents of the first set of braces represent the extent to which the child prefers working to going to school. The contents of the second set of braces represent the immediate cost of extra schooling: the foregone wage plus the marginal cost of schooling. Thus the left hand side of (19) represents the immediate gains of working rather than attending school. In contrast, the right hand side represents the difference between the value of increasing educational capital and the value of increasing work experience: the long-term return to education.

In state D, the weak inequalities in both (13) and (14) apply, even when evaluated at zero hours of work and schooling. The choice for the marginal hour is not between work and schooling, but between leisure and each of the alternatives, and leisure is preferred in both cases. The current wage rate and increase in work experience are not sufficient to outweigh the disutility of work (or the productivity of the child in domestic activities<sup>9</sup>). Similarly, the increase in educational capital is not sufficient to outweigh the disutility and financial costs of school.

The way in which the child's choice changes through time is determined in part by the evolution of the three shadow prices:  $\lambda$ ,  $\theta$  and  $\gamma$ . The evolution of  $\lambda$  is given by (17) in the case of perfect capital markets. However, *when capital markets are imperfect*, it will be affected by the short-run financial circumstances of the household, increasing in times of scarcity and decreasing when finances improve. The evolution of the other two shadow prices is given by equations (15) and (16), which can be rewritten as:

$$\dot{\gamma} = -\gamma_t \cdot \frac{\partial f}{\partial E_t} - \lambda_t \cdot \frac{\partial W}{\partial E_t} \cdot H_t \quad (20)$$

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<sup>9</sup> When a child is neither at work nor at school, the data and casual observation both suggest that the child may be engaged in domestic activities such as cooking and child care.

$$\dot{\theta} = -\theta_t \cdot \frac{\partial g}{\partial K_t} - \lambda_t \cdot \frac{\partial W}{\partial K_t} \cdot H_t \quad (21)$$

The differential in the first term of the right hand side of each equation represents the depreciation of work experience and educational capital, respectively, and is therefore negative, giving a positive sign to the term as a whole. This term therefore indicates a tendency for the value of investment in education and experience to increase through time. In contrast, the second term is the negative of the value of the experience/education in terms of increased current income. It is negative because the value of investment declines as fewer future earnings possibilities remain.

Conditions (19), (20) and (21) allow a child's progress through the three possible states to be traced, assuming that there are no sudden changes to the exogenous variables. A very young child will start in state D, neither working nor going to school. In state D, the second terms of (20) and (21) are zero and both the shadow prices will increase, moving equations (13) and (14) towards equality and thus a move into a new state. This will typically be state A, according to (19), as their wages would be very low and the value of basic education for the future high. In state A, the second terms of (20) and (21) are still zero and so both shadow prices continue to increase. However, one would expect the shadow price on work experience,  $\gamma$ , to increase faster as it is likely that this depreciates more rapidly than the more general skills provided by education. This differential rate of increase will eventually reduce the right hand side of (19), while the left hand side is increasing as a result of increased wages and (possibly) increased schooling costs. Thus the child will switch to state B.

In state B, the evolution of the variables is more complex, as the second terms on the right hand sides of (20) and (21) are now non-zero. With a model of this generality, it is probably possible to construct cases in which children will return to state A or state D again. However, the continual increase in the wage and probable increase in the disutility of school, means that it is most likely that the left hand side will eventually exceed the right hand side

of (19) and the child will move to state C.

Implications of the theory for the empirical model are discussed in Section 6.

## **5. Estimation Issues**

The dependent variable in the equations we estimate is the hours of child work on the household farm. Since not all children have the option to work on the family farm, we use the sub-sample of households that operate land. In rural Pakistan, 36% of households own land and 51% operate land. Ownership, at 49%, is not dissimilar in rural Ghana but there are more ways of sharing land and 90% of households operate some land. Since many children do not participate in farm work, we use the tobit estimator. All reported standard errors are robust (e.g. White, 1980, 1982), and adjusted to permit observations within clusters (primary sampling units) to be correlated (e.g. Deaton, 1997).

The main estimation issue arises from the fact that child labour contributes to household income, making the income variable endogenous. Since children working on the family farm are not paid a wage, their contribution cannot be deducted from total income. Even if we could observe child income the endogeneity problem would not be resolved by subtracting it from the total if the labour supply of different household members is jointly determined. We instrument income using the following procedure which gives consistent estimates when the dependent variable is censored (see Smith and Blundell, 1986). Suppressing individual subscripts, let the main equation, for hours of work (H), be written as:

$$H^* = X\beta + Y\gamma + e \quad (22)$$

where hours (H) is a censored endogenous variable, X is a vector of exogenous variables and Y is a measure of household living standards, which is endogenous. The auxiliary equation describing Y in terms of exogenous variables Z (Z includes X) is:

$$Y = Z\pi + u \quad (23)$$

The error terms e and u are assumed to be jointly normally distributed. Let  $e = u\alpha + \varepsilon$ .

Substituting for e in (22) gives the conditional model,

$$H^* = X\beta + Y\gamma + u\alpha + \varepsilon \quad (24)$$

where  $u$  is an estimate obtained by OLS estimation of (23), and (24) can be estimated by the standard tobit procedure. It can be very difficult to find appropriate instruments for income, but the availability of community-level variables in our household surveys offers instruments that are not only valid but fairly efficient (see Section 7).

## **6. The Empirical Specification**

The discussion in Section 4 suggests that child labour may be expected to depend upon child age, the child wage, household income, the costs of school attendance, measures of the relative disutility of work and school, and the returns to education and experience. A quadratic in child age is included in the equations, and we assume that tastes for work/school are randomly distributed. The rest of this section considers the empirical translation of the other variables suggested by theory.

Since children working on the family farm are not paid an explicit wage, their marginal product is captured by *acres of land operated*, *number of plots of land* (available only for Ghana), indicators for the *mode of operation of the land* (sharecropping, rent in both countries and, additionally, whether free or village land in Ghana), *household size*, and indicators of the *age and gender composition* of the household. We also include province dummies and community-level indicators of local *farming technology*, *economic infrastructure* and *dynamism*, which may explain individual variation in productivity.

The dynamic returns to education and experience are difficult to measure but are expected to bear a systematic correlation to parents' education. This is both because children with better educated parents are expected to derive more from their education, and because they are likely to be better informed in job-search. This apart, educated parents may have a stronger aversion to child work, though if they are also more likely to take jobs outside the home, their children may more often be found engaged on the household farm. The variables used are dummies defined for the level of schooling completed by each of the mother and father of the child.

Rather than measure expenditures on schooling, we use dummy variables for whether a primary, middle and secondary school are present in the community where the child lives. Access may further be influenced by whether there is *public transport* in the community. The age of the school (available for Ghana only) is also included on the grounds that it may be correlated with its *quality*.

Religion and ethnicity variables are expected to pick up *attitudinal/cultural differences* in the valuation of school and work. This is expected to be especially relevant when looking at girls, towards whom attitudes tend to incorporate greater heterogeneity. Community-level indicators of changes in economic circumstances such as responses to questions regarding whether *life was better in 1991 than in 1981* and whether it was *easier to find work* (Ghana only) are also included. A range of community-level regressors is a good alternative to a full set of cluster (or community) dummies when the number of dummies is too large for the cross-sectional sample to support.

In the model, the influence of *household income* or wealth (through  $Y$ ) is captured by the shadow price,  $\lambda$ , with a high price representing low income. In the case of perfect capital markets, the choice between school and work will depend only on their relative marginal utilities (see (19))<sup>10</sup>. However, in the choice between work and leisure (see (14)), an increase in the shadow price will increase both the short-run and the long-run benefits of work, so that children from poor households may be expected to work more than the non-poor. A sudden reduction in household resources, will increase  $\lambda$  without a corresponding increase in the two other shadow prices, increasing the likelihood of work in that period. In the presence of imperfect capital markets, poor households will be relatively likely to be capital market constrained, and will therefore be less able to benefit from smoothing out the uneven earnings profile that prolonged education generates. Thus, irrespective of borrowing constraints, we may expect a negative effect of household income on child work.

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<sup>10</sup> Note that (20)-(21) are homogeneous of degree zero in all three prices.

We use annual household *food expenditure per capita*<sup>11</sup> as a proxy for permanent income (see Altonji, 1983), since this is consistent with the evidence that poor households achieve a degree of consumption smoothing (see Townsend (1994) for example) despite imperfect capital markets. The expenditure variable includes the imputed value of home-produced consumption. Land operated and parental education, discussed above, may also reflect permanent income. Together with a variable indicating the existence in the community of mutual aid for workers (available for Ghana), land size (which may be used as collateral) will also capture borrowing ability. As measures of household's insecurity, we include indicators of whether the household has a *female head*, whether *mother is absent* and whether *father is absent*. We also allow the proportion of income the household devotes to the child (Y) to depend upon *birth order* (evidence of such effects is, for example, in Das Gupta (1987) and Butcher and Case (1994)) and on whether the child is the *child of the household head*. Alternative relations include niece, nephew, grandchild, sibling, and it is not unusual in Ghana to find foster children in the household (see Ainsworth).

Means for the sub-samples of working and non-working children are in Appendix Tables 1 and 2. The variables used differ between the countries to some extent because of differences in the questionnaires. A comparison of means across these sub-samples, and a comparison of means across the two countries can be found in Bhalotra and Heady (2000).

## **7. Determinants of Child Work**

The marginal effects for both the probability of working and the hours of work conditional on working are presented in Tables 8 and 9.

### **7.1. Identification of the Effect of Household Living Standards**

Instruments for income in Pakistan are cluster (community) level variables including the community-level average of income, the percentage of households that own land, the percentage that sharecrop, and indicator dummies for the presence of a railway line and

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<sup>11</sup> There is no need to assume a equivalence scale because size and detailed household composition variables are included in the equations.

electricity. The first stage regression explains 31% of the variation in per capita food expenditure and the instruments are jointly significant at 1% ( $F(5,101)=8.4$ ). In Ghana, a similar set of community variables was used: indicators for the presence of a market, a road, a post office, piped water, and a grating machine. While the food expenditure regression explains 29% of the variation, these variables are jointly insignificant ( $F(5,239)=0.67$ ). We therefore used just the dummies for market and piped water, which are significant at 10% and can be excluded from the hours equation. Most papers in this field do not instrument household income (see Section 2). We find that, for both countries and both genders, the results change significantly (and in the expected direction) if we do not instrument, and this finding underlines the importance of employing IV methods in studying the impact of household income on child work. The rest of this section discusses the interesting findings, first for Ghana, and then for Pakistan, where contrasts with Ghana are highlighted.

## **7.2. Results for Ghana**

Child characteristics have broadly similar effects for boys and girls. Child work increases with *age*, at a decreasing rate. A complete set of *birth-order* dummies was included but their coefficients were poorly determined. They were therefore replaced by a single indicator variable for whether the child in question was the oldest child in the household. This, and the dummy indicating *relation to household head* are insignificant.

Turning to household characteristics, a striking result is that there is no significant correlation for boys between the hours spent in farm work and the *standard of living of the household* as measured by its per capita food expenditure, though there is a hint of the expected negative relation for girls, significant at the 13% level. The Smith-Blundell test is unable to reject weak exogeneity of expenditure for girls' work. As a check on the direction of the bias in an ordinary least squares model, the hours equation was re-estimated without instrumenting p.c. food expenditure. For both boys and girls, this results in a positive effect of household expenditure on child work that is significant at the 1% level. An upward bias in this coefficient is exactly what we would expect since child work will tend to increase

household consumption possibilities *as long as* the additional product generated by children exceeds any additional consumption required by them on account of their calorie needs rising with work effort. The large size of the bias underlines the importance of using IV methods in this exercise. It probably explains the vast variety of income effects estimated in the recent literature on child labour, the majority of which do not correct for endogeneity of income (see Section 2).

Households in Ghana often own several plots of land, with ownership often divided between men and women in a household (e.g. Iversen, 2000). We find a strong positive effect of the *number of farms* operated on hours of work for boys and girls. Since this result obtains when controlling for acres of land operated by the household, it suggests not a size effect but an effect associated with the subdivision of land. This merits further micro-level research. *Household size* and *acres of land operated* are insignificant, though the mode of operation of land (sharecrop, rent etc) matters<sup>12</sup>. Boys work is uncorrelated with *household composition* but the proportion of under-7 boys in the household exercises a weakly negative effect on girls' hours. The *absence of the father* from the home has a significant positive effect on girls' farm work but no effect for boys.

The insignificance of land size and household size suggests that the hours of child work on the family farm are not very sensitive to the household-specific marginal product. This might be because while more land means more fruitful work opportunities for the household, it also signifies greater wealth and it may therefore be picking up the effect that we expect per capita expenditure to fully capture.

The only significant effect of the parent education variables is that the sons of mothers with secondary-level education work less. Since this is at given levels of household living standards, it would appear to reflect preference heterogeneity rather than resource constraints.

The *region dummies* are jointly very significant and have larger effects for girls

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<sup>12</sup> Land acres does become positive and significant if province dummies are dropped. However, there is no reason to prefer a specification without province dummies.

( $\chi^2_6=58$  for boys and  $\chi^2_6=48$  for girls,  $p>\chi^2=0$  for both). *Religion* has no systematic effect on boys' work ( $\chi^2_2=2$ ,  $p>\chi^2=0.37$ ) but Christian girls work significantly fewer hours on average than Animist girls who work less than Muslim girls ( $\chi^2_2=5.3$ ,  $p>\chi^2=0.07$ ). The dummies for ethnicity are insignificant for girls ( $\chi^2_5=3.2$ ,  $p>\chi^2=0.67$ ). Boys of Ewe *ethnicity* are significantly less likely to work ( $\chi^2_5=11.9$ ,  $p>\chi^2=0.04$ ).

The effects of community variables are very different between boys and girls<sup>13</sup>. The one variable that has a very similar and negative effect for boys and girls is the *age of the secondary/technical college* in the village. Dummies for *the presence of primary, middle and secondary schools* in the cluster take the expected negative signs but their effects are poorly determined. Variables that have a significant negative effect on boys' work are indicators for *electricity* in the village, and for whether there was *more rainfall* in 1991-2 than in the preceding year. A strong negative effect of the existence of *public transport* in the village on girls' work is consistent with the hypothesis that distance to school may deter the attendance of girls more than it does that of boys. *Irrigation, tractors* and *fertilizers* do not have significant effects on child work, nor does the presence of a village *bank*. The set of community variables is jointly significant for both boys ( $\chi^2_{17}=34$ ,  $p>\chi^2=0.01$ ) and girls ( $\chi^2_{17}=27.6$ ,  $p>\chi^2=0.05$ ).

*Overall*, among a range of variables in the model, those that display a significant relation with hours of child work on the household farm are child age, the number of farms owned, mothers' education, region, ethnicity, religion, the age of the local secondary/technical school, availability of public transport, rainfall, electricity, and the dynamism of the region as reflected in subjective assessments of life and work opportunities having got better in the last ten years. Among variables directly manipulable by *policy* are maternal education, school quality (age of local school), public transportation in the village, electricity and irrigation (rainfall variable).

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<sup>13</sup> The significance of cluster-specific (or community) variables in determining child work in Ghana is substantially altered once standard errors are robust and cluster-adjusted. All equations report the correct (adjusted) standard errors.

### **7.3. Results for Pakistan**

The child's *age* has a positive effect on hours worked, which is much larger for boys than for girls. There are no *birth order* effects. For girls, being the *child of the household head* increases the probability of work, though not for boys.

*Household living standards have a highly significant negative effect on boys' hours of work.* An increase in per capita food expenditure of 10% is estimated to reduce the probability of boys' work by 6 percentage points (so that, at the mean, the observed participation rate of 32% would fall to 26%) and, conditional on working, the same change in expenditure is expected to reduce hours of work by 1.28 per week. These are substantial effects. The corresponding effect for girls is also negative but about a fifth of the size and insignificant. The stronger effect for boys is consistent with the much greater participation of boys in school, as compared with girls in rural Pakistan (Section 3): Households with relatively high incomes are better able to afford to send their children to school and, in this, boys have priority over girls. In contrast, variation in child farm work in Ghana appears to be independent of household income for boys and girls alike. This is consistent with the apparently greater facility for combining work and school in Ghana as compared with Pakistan (see Section 3). Weak exogeneity of per capita food expenditure is rejected for both genders in Pakistan. Replacing IV with standard tobit estimation results in per capita food expenditure being completely insignificant for both boys and girls. This is consistent with the expected sign of the simultaneity bias and, as in the case of the Ghana estimates, it underlines the importance of instrumenting this variable.

As discussed in Section 6, we would expect the marginal product or shadow price of family (including child) labour on the family farm to depend upon farm size and household size. In contrast with our findings for Ghana, these variables are significant and take the expected signs in Pakistan. *Acres of land operated* by the household has a positive effect on girls' work, though it is insignificant in the boys' equation. For girls, it would seem that any (negative) wealth effect of acres is captured by household food expenditure and the observed

(positive) effect is a “wage” effect. *Household size* has a negative effect on child work which is significant for both genders but considerably larger for boys than for girls. Existing studies of child labour in other contexts tend to find positive effects of household size (see Section 2). However, where the discussion pertains exclusively to child work on household farms and farm sizes are relatively small, the negative effect of household size on child work is exactly what theory would predict. Our results therefore caution against hasty generalisations to the effect that the wellbeing of children is inversely related to the size of their households.

At given household size, there are some fairly complex effects of the *age-gender composition of the household* on child hours of work (see Table 9). The *proportion of females in the household* has a negative effect on child work, significant at about 10%, suggesting that child and female labour are substitutes. In contrast to Ghana, the children of *female-headed households* in Pakistan are more likely to be in farm work. This suggests there are aspects of illbeing and/or insecurity in female headed households that a (simultaneity-adjusted) household income measure does not pick up. Work intensity for girls is, at the 15% significance level, a positive function of *age of the household head*, an indication that young adults (or parents) are better able to “protect” their daughters from work than older adults.

There is a significant negative effect of *fathers’ secondary education* that is restricted to girls. *Mothers’ education* to the level of middle or secondary school has a strong negative effect on child work that is a bit bigger for boys than for girls.

The presence in the cluster of a *primary school* for girls reduces the farm labour of girls and, possibly because of sibling competition for resources, the presence of a primary school for boys increases girls’ farm labour. These school-access variables have no effect on boys’ work. Cluster specific variables which have a significant effect on boys’ work include positive effects from a *market* and negative effects from a *telephone*, a *bus route* and a *canal*. For girls, community-level variables are altogether much less significant and the only effect to speak of is a negative one associated with a bus route. The bus route effect, common to boys and girls, may denote mobility away from the household farm, whether for outside work or for school. The cluster-level variables are jointly significant at the 10% level for boys

( $\chi^2_{11}=18.2$ ,  $p>\chi^2=0.08$ ) and insignificant for girls ( $\chi^2_{11}=15.3$ ,  $p>\chi^2=0.18$ ).

*Province dummies* ( $\chi^2_3=11.7$ ,  $p>\chi^2=0.0$ ) and *religion dummies* ( $\chi^2_2=17.9$ ,  $p>\chi^2=0.0$ ) are jointly significant for girls though not for boys ( $\chi^2_3=4.5$   $\chi^2_2=2.9$ , respectively). Amongst girls, Christians work significantly less than Muslims who work significantly less than other Non-muslims. Christians constitute 1.5% of the population and other non-Muslims (mostly Hindus) account for another 3.6%; the vast majority are Muslim.

## **8. Conclusions and Policy Implications**

The results of the paper are interesting not only with regard to similarities and differences between Pakistan and Ghana but also with regard to gender differences. These are briefly summarised in this section.

Looking across boys and girls in Ghana and Pakistan, it is only for boys in Pakistan that we observe a significant negative relation of child work and household income. For comparison with existing empirical work on child labour, it is worth emphasising that we would find even weaker income effects if we did not control for simultaneity bias.

Father's secondary education significantly reduces girls' work in Pakistan but has no effect on the labour of the other three groups. Mother's education tends to reduce child hours of work in both countries, the effects being larger for boys than for girls. These findings demonstrate the importance of women's agency, irrespective of continent and culture and after controlling for levels of living. This reinforces a growing literature on the importance of female education in achieving positive outcomes for children. The magnitude of the effects we find is so large that policy aimed at eliminating child work is best targeted here.

The different effects of farm size and household size on child labour in the two countries is consistent with Ghana having a higher land-labour ratio than Pakistan. We find, contrary to popular thinking, that children from larger households are not more likely to work or to work harder. Existing work has tended to implicitly think of large size as creating large consumption needs and therefore greater labour supply to meet needs. This neglects the fact

that household assets are often constrained, at least in South Asia, and that this may drive the marginal productivity of family labour to levels that are too low to compensate withdrawal from school, leisure, or other alternative uses of time.

There are some interesting and large effects of household composition in Pakistan, though the corresponding effects in Ghana are weak. We find that children tend to work *fewer* hours if they have male siblings younger than themselves, which contradicts evidence from other regions which finds that children - and especially girls - with more siblings work longer hours on average (see Lloyd (1993) and Jomo (1992)). A significant positive effect of female-headed households on child work in Pakistan is consistent with these families facing tighter labour and capital market constraints, after holding income constant.

These results obtain upon holding constant region, religion and ethnicity of the household as well as a variety of community characteristics which, amongst other things, are expected to control for demand effects. There is some evidence that both school quality and access to school affect child labour. The negative effect of the presence of a canal on boys' work in Pakistan and the negative effect of increased rainfall on boys' work in Ghana may indicate the power of interventions that minimise income fluctuations in reducing child labour.

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**Table 1**

**Boys in Ghana**  
**Participation Rates in School & Work**

<b>Age in years:</b>	<b>7-9</b>	<b>10-14</b>	<b>15-17</b>
school attendance	72.1%	77.8%	58.9%
outside employment	0.16%	0.65%	1.31%
work on the household enterprise	0.78%	2.7%	4.6%
<b>work on the household farm</b>	31.2%	52.4%	67.4%
domestic work	76.8%	89.8%	85.3%
number of observations	644	927	457

**Notes:** Figures are percentages for the sample used in this paper which is the sample of rural households that own or operate agricultural land.

**Table 2**

**Girls in Ghana**  
**Participation Rates in School & Work**

<b>Age in years:</b>	<b>7-9</b>	<b>10-14</b>	<b>15-17</b>
school attendance	63.6%	71.1%	44.4%
outside employment	0.0%	0.13%	1.17%
work on the household enterprise	1.3%	3.2%	9.1%
<b>work on the household farm</b>	23.7%	47.5%	61.7%
domestic work	82.8%	96.2%	94.2%
number of observations	615	793	342

**Notes:** Figures are percentages for the sample used in this paper which is the sample of rural households that own or operate agricultural land.

**Table 3**

**Boys in Pakistan**  
**Participation Rates in School & Work**

<b>Age in years:</b>	<b>7-9</b>	<b>10-14</b>	<b>15-17</b>
school attendance	59.6%	72.1%	50.5%
outside employment		4.3%	12.0%
work on the household enterprise		0.64%	3.7%
<b>work on the household farm</b>		32.0%	48.5%
domestic work	n.a.	n.a.	n.a.
number of observations	503	621	301

**Notes:** Figures are percentages for the sample used in this paper which is the sample of rural households that own or operate agricultural land. The Pakistan survey did not address questions about domestic work to boys.

**Table 4**

**Girls in Pakistan**  
**Participation Rates in School & Work**

<b>Age in years:</b>	<b>7-9</b>	<b>10-14</b>	<b>15-17</b>
school attendance	31.4%	25.5%	10.7%
outside employment		12.0%	12.9%
work on the household enterprise		1.2%	1.2%
<b>work on the household farm</b>		39.0%	48.6%
domestic work		99.4%	97.8%
number of observations	441	567	249

**Notes:** Figures are percentages for the sample used in this paper which is the sample of rural households that own or operate agricultural land. Data on work were not gathered for children under 10.

**Table 5**

**Hours of Farm Work**  
**Boys and Girls in Ghana and Pakistan**

Age in years	<b>7-9</b>	<b>10-14</b>	<b>15-17</b>
Ghana boys	13.0 (sd=12.9) N=201	16.6 (sd=13.4) N=486	22.5 (sd=15.3) N=308
Ghana girls	15.0 (sd=13.2) N=146	15.8 (sd=12.8) N=377	20.2 (sd=12.1) N=211
Pakistan boys		25.6 (sd=18.8) N=191	29.8 (sd=19.7) N=141
Pakistan girls		14.9 (sd=14.1) N=201	13.6 (sd=11.6) N=113

**Notes:** Figures are mean hours of work per week for the sample of rural farm workers (number of whom is N) and standard deviations (sd) are in parentheses.

**Table 6**

**Rural Ghana: 7-14 Year Olds**  
**How Often Is Farmwork Combined With Schooling?**

	<b>Boys</b>	<b>Girls</b>
<b>Farmwork only</b>	11.5%	10.7%
<b>Farmwork &amp; School</b>	32.2%	26.4%
<b>School only</b>	43.2%	41.4%
<b>Neither</b>	13.1%	21.5%
Number of obs.	1571	1408

**Notes:** The sample is restricted to children whose households own or operate land. Figures are percentages of the gender group.

**Table 7**

**Rural Pakistan: 10-14 Year Olds**  
**How Often Is Farm Work Combined With Schooling?**

	<b>Boys</b>	<b>Girls</b>
<i>For children not in wage work:</i>		
Farm work only	15.3%	30.0%
Farm work & school	14.2%	3.0%
School only	56.7%	22.4%
Neither	10.0%	38.3%
<i>For children in wage work:</i>		
Wage work & farm work	1.3%	2.0%
Wage work & school	0.5%	0.0%
Number of observations	621	567

**Notes:** The sample is restricted to children whose households own or operate land. Figures are percentages of the gender group. Since no children in Ghana engage in wage work, the comparable figures here are the first set. The last two rows are here to demonstrate that wage work is seldom combined with other activities and so can be treated separately.

**Table 8**  
**Marginal Effects for Hours of Child Work on the Household Farm**  
**Rural Ghana**

	<u>Boys</u>		<u>Girls</u>	
	<u>Conditional on working</u>	<u>Probability of working</u>	<u>Conditional on working</u>	<u>Probability of working</u>
<b><u>Child characteristics</u></b>				
age	2.28*	0.15*	2.14*	0.15*
age squared	-0.66	-0.0042	-0.068	-0.0046
first child	0.74	0.048	0.78	0.053
child of head of hh	-0.47	-0.030	1.22	0.083
<b><u>Household resources</u></b>				
ln p.c. food expenditure	0.46	0.030	-3.15	-0.22
<b><u>Farm land</u></b>				
acres of land	-0.0092	-0.00060	0.043	0.0029
acres squared	-0.00001	-8.93e-07	-0.000046	-3.14e-06
number of farms	0.70*	0.045*	0.70*	0.048*
rent land?	2.13*	0.14*	1.96	0.13
sharecrop land?	-0.59	-0.038	0.33	0.022
freely available land?	2.23*	0.15*	2.32*	0.16*
village-owned land?	0.53	0.034	3.01*	0.21*
<b><u>Household structure</u></b>				
household size	-0.054	-0.0035	-0.24	-0.016
proportion female	-1.63	-0.11	0.30	0.021
female head?	-0.32	-0.021	-0.70	-0.048
age of household head	0.018	0.0012	-0.0014	-0.000098
mother absent	-0.28	-0.018	-0.41	-0.028
father absent	1.17	0.076	2.53*	0.17*
males under 7 years	-1.25	-0.081	-6.90*	-0.47*
males 7-14 years	omitted group	omitted group	omitted group	omitted group
males 15-19 years	-2.75	-0.18	-3.31	-0.23
males 20-59 years	-0.81	-0.053	2.40	0.16
males over 60 years	0.46	0.030	2.79	0.19
females under 7 years	3.22	0.21	-5.67	-0.39
females 7-14 years	omitted group	omitted group	omitted group	omitted group
females 15-19 years	-1.83	-0.12	-2.38	-0.16
females 20-59 years	-0.46	-0.030	-2.16	-0.15
females over 60 years	0.85	0.055	2.93	0.20
<b><u>Parents' education</u></b>				
mother none	omitted group	omitted group	omitted group	omitted group
mother primary educ	0.68	0.044	-0.94	-0.064
mother mid/sec educ.	-1.44*	-0.093*	-0.52	-0.035
father none	omitted group	omitted group	omitted group	omitted group
father primary educated	-0.24	-0.016	1.61	0.11
father secondary educ.	-0.50	-0.032	0.46	0.032
<b><u>Community variables</u></b>				
<b><u>Access to school</u></b>				
local primary school	-0.64	-0.42	-0.96	-0.066
local middle school	-1.43	-0.93	-0.92	-0.062

local secondary school	-1.69	-0.11	-1.69	-0.12
local public transport	-0.42	-0.028	-1.72*	-0.12*
<b><i>Quality of school</i></b>				
age of primary school	0.035	0.0023	0.052*	0.0035*
age of middle school	0.017	0.0011	-0.027	-0.0018
age of secondary sch	-0.045	-0.0030	-0.044	-0.0030
<b><i>Farming technology</i></b>				
co-operative society	-0.024	-0.016	1.49	0.10
mutual aid for workers	-0.60	-0.039	-1.23	-0.84
irrigation	1.64	0.11	-2.38	-0.16
increased rain this year	-1.67*	-0.11*	-0.32	-0.022
husking machine	-0.84	-0.055	-1.03	-0.070
fertilizer	0.46	0.030	1.42	0.097
<b><i>Economic infrastructure</i></b>				
electricity	-1.82*	-0.12*	-1.49	-0.10
bank	-0.56	-0.037	-0.95	-0.065
<b><i>Dynamism</i></b>				
life better than 1981	1.78*	0.12*	1.11	0.076
easier to find work	0.36	0.023	1.73*	0.12*
<b><u>Regions</u></b>				
Centre	1.27	0.082	3.74*	0.25*
East	-8.06*	-0.53*	-5.07*	-0.35*
West	-1.18	-0.077	3.13	0.21
Volta	2.42	0.16	2.73*	0.19*
Ashanti	1.78	0.12	5.7*	0.39*
Brong Ahafo	-0.94	-0.061	2.44	0.17
North	omitted group	omitted group	omitted group	omitted group
Upper West	omitted group	omitted group	omitted group	omitted group
Upper East	omitted group	omitted group	omitted group	omitted group
<b><u>Ethnic groups</u></b>				
Akan	-0.76	-0.049	-0.071	-0.0048
Ewe	-5.98*	-0.39*	-1.00	-0.069
Ga-adangbe	-2.96	-0.19	-1.82	-0.12
Dagbani	1.02	0.067	-2.19	-0.15
Nzema	1.97	0.13	-0.43	-0.030
Other	omitted group	omitted group	omitted group	omitted group
<b><u>Religion</u></b>				
Christian	-1.95	-0.13	-3.31*	-0.23*
Animist/traditional	-1.54	-0.10	-2.59	-0.18
Muslim	omitted group	omitted group	omitted group	omitted group
<b>Notes:</b> <i>Dependent variable</i> =hours worked by 7-14 year old children on the household farm. Marginal effects are at the observed censoring rate. Asterisks denote significant effects at 7%. Groups were omitted to avoid exact multicollinearity. This required omitting several regions because they coincided with ethnic groups. Refer to Appendix Table 5 for coefficient estimates and equation diagnostics.				

**Table 9**  
**Marginal Effects for Hours of Child Work on the Household Farm**  
**Rural Pakistan**

	<u>Boys</u>		<u>Girls</u>	
	<u>Conditional on working</u>	<u>Probability of working</u>	<u>Conditional on working</u>	<u>Probability of working</u>
<b><u>Child characteristics</u></b>				
age	1.82*	0.081*	0.45	0.033
first child	0.21	0.0091	0.18	0.013
child of head of hh	3.02	0.13	2.14*	0.15*
<b><u>Household resources</u></b>				
ln p.c. food expenditure	-12.8*	-0.57*	-3.87	-0.28
<b><u>Farm land</u></b>				
acres of land	0.017	0.00076	0.034*	0.0025*
rent land?	-0.087	-0.0038	2.03*	0.15*
sharecrop land?	2.57*	0.11*	0.53	0.038
<b><u>Household structure</u></b>				
household size	-0.54*	-0.024*	-0.29*	-0.021*
proportion female	-12.9	-0.57	-10.6	-0.76
female head?	9.76*	0.43*	3.99*	0.29*
age of household head	0.047	0.0020	0.049	0.0035
males under 5 years	-24.4*	-1.08*	-9.79	-0.70
males 5-9 years	-19.3*	-0.86*	-18.3*	-1.31*
males 10-14 years	omitted group	omitted group	omitted group	omitted group
males 15-19 years	-18.2*	-0.81*	-11.8	-0.85
males 20-59 years	-4.21	-0.19	-15.4*	-1.11*
males over 60 years	-15.8	-0.70	0.36	0.026
females under 5 years	-1.63	-0.072	5.79	0.42
females 5-9 years	10.0	0.44	3.40	0.24
females 10-14 years	omitted group	omitted group	omitted group	omitted group
females 15-19 years	-22.3*	-0.99*	-3.43	-0.25
females 20-59 years	12.4	0.55	6.29	0.45
females over 60 years	-11.3	-0.50	-32.9*	-2.37*
<b><u>Parents' education</u></b>				
mother none	omitted group	omitted group	omitted group	omitted group
mother primary	1.07	0.047	-2.93	-0.21
mother mid/secondary	-44.3*	-1.96*	-30.5*	-2.19*
father none	omitted group	omitted group	omitted group	omitted group
father primary	0.82	0.036	-0.37	-0.026
father middle	1.27	0.056	0.25	0.018
father secondary	3.45	0.15	-6.29*	-0.45*
<b><u>Community variables</u></b>				
<b><u>Access to school</u></b>				
local primary sch, girls	1.62	0.072	-3.20*	-0.23*
local middle sch, girls	-0.65	-0.029	-0.55	-0.39
local primary sch, boys	2.09	0.092	7.03*	0.51*
local middle sch, boys	0.92	0.041	0.053	0.0038
<b><u>Farming technology</u></b>				

canal	-2.50*	-0.11*	1.05	0.076
tractor	0.021	0.00094	-0.0062	-0.00045
<b><i>Economic infrastructure</i></b>				
shop	3.16	0.14	2.34	0.17
market	9.78*	0.43*	-0.18	-0.013
post office	1.17	0.052	-0.49	-0.035
telephone	-2.99*	-0.13*	-0.31	-0.022
bus	-1.51	-0.067	-1.69	-0.12
<b><i>Regions</i></b>				
Punjab	omitted group	omitted group	omitted group	omitted group
Baluchistan	-3.12	-0.14	-8.25*	-0.59*
Sindh	-0.12	-0.0053	2.11	0.15
NWFP	3.52	0.16	-0.39	-0.028
<b><i>Religion</i></b>				
Christian	7.32	0.32	-7.83	-0.56
Non-muslim	-3.39	-0.15	12.3	0.89
Muslim	omitted group	omitted group	omitted group	omitted group
<b>Notes:</b> <i>Dependent variable</i> =hours worked by children on the household farm. In Pakistan, children are 10-14 year olds. Marginal effects are at the observed censoring rate. Asterisks denote significant effects at 7%. Groups were omitted to avoid exact multicollinearity. Refer to Appendix Table 5 for coefficient estimates and equation diagnostics.				

**Appendix Table 1**  
**Variable Means for Workers and Non-Workers by Gender**  
**Rural Ghana**

	<u>Boys in Ghana</u>		<u>Girls in Ghana</u>	
	<u>Workers</u>	<u>Non-workers</u>	<u>Workers</u>	<u>Non-workers</u>
<b><u>#Observations</u></b>	687	884	523	884
<b><u>Dependent variable</u></b>				
hours worked on farm	15.5	0	15.5	0
<b><u>Child characteristics</u></b>				
age	10.9	9.8	10.9	9.7
first child	0.61	0.47	0.64	0.48
child of head of hh	0.77	0.84	0.72	0.81
<b><u>Household resources</u></b>				
ln pc food expenditure	-0.33	-0.40	-0.27	-0.39
<b><u>Size of farm</u></b>				
acres of land	9.34	8.23	9.77	7.57
number of farms	2.0	1.94	2.1	1.92
rent land?	0.086	0.055	0.071	0.083
sharecrop land?	0.070	0.067	0.067	0.066
freely available land?	0.23	0.15	0.21	0.15
village-owned land?	0.23	0.26	0.24	0.28
<b><u>Household structure</u></b>				
household size	7.3	7.2	6.9	7.3
proportion female	0.42	0.42	0.61	0.60
female head?	0.27	0.20	0.34	0.22
age of household head	49.8	47.8	49.5	48.0
mother absent	0.27	0.23	0.30	0.23
father absent	0.41	0.30	0.47	0.32
males under 7 years	0.10	0.11	0.091	0.11
males 7-14 years	0.28	0.28	0.10	0.095
males 15-19 years	0.059	0.049	0.059	0.049
males 20-59 years	0.10	0.11	0.11	0.11
males over 60 years	0.033	0.032	0.032	0.028
females under 7 yrs	0.098	0.097	0.097	0.103
females 7-14 years	0.085	0.088	0.27	0.26
females 15-19 years	0.041	0.034	0.037	0.039
females 20-59 years	0.16	0.18	0.18	0.18
females over 60 years	0.033	0.020	0.037	0.019
<b><u>Parents' education</u></b>				
mother none	0.68	0.66	0.66	0.69
mother primary	0.15	0.11	0.13	0.14
mother secondary	0.17	0.23	0.21	0.17
father none	0.51	0.49	0.46	0.53
father primary	0.086	0.088	0.079	0.085
father secondary	0.40	0.42	0.46	0.38

**Community variables****Access to school**

local primary school	0.85	0.89	0.87	0.88
local middle school	0.61	0.64	0.70	0.63
local secondary school	0.14	0.11	0.11	0.10
local public transport	0.52	0.50	0.52	0.47

**Quality of school**

age of primary school	33.5	32.1	35.1	32.6
age of middle school	15.1	10.1	15.1	11.6
age of sec/tech sch	16.1	17.1	15.9	18.0

**Farming technology**

co-operative society	0.29	0.31	0.36	0.27
mutual aid for workers	0.87	0.88	0.86	0.88
irrigation	0.038	0.041	0.026	0.039
increased rain this year	0.64	0.77	0.60	0.75
husking machine	0.074	0.060	0.072	0.058
fertilizer	0.56	0.58	0.57	0.54

**Economic****infrastructure**

electricity	0.12	0.14	0.15	0.17
bank	0.094	0.084	0.14	0.076

**Dynamism**

life better than 1981	0.27	0.23	0.32	0.26
easier to find work	0.27	0.31	0.32	0.29

**Regions**

Central Region	0.14	0.083	0.15	0.10
Eastern Region	0.028	0.25	0.027	0.21
West	0.096	0.11	0.12	0.11
Volta Region	0.14	0.088	0.14	0.081
Ashanti Region	0.24	0.078	0.26	0.078
Brong Ahafo Region	0.13	0.13	0.15	0.14
North	0.08	0.11	0.05	0.12
Upper West	0.04	0.04	0.03	0.05
Upper East	0.08	0.10	0.08	0.11

**Ethnic groups**

Akan	0.57	0.48	0.61	0.46
Ewe	0.038	0.058	0.056	0.059
Ga-adangbe	0.038	0.11	0.024	0.089
Dagbani	0.054	0.041	0.028	0.049
Nzema	0.013	0.013	0.015	0.017
Other	0.29	0.30	0.26	0.32

**Religion**

Christian	0.61	0.60	0.65	0.58
Animist/traditional	0.19	0.25	0.16	0.25
Muslim	0.20	0.15	0.19	0.17

**Notes:** The sample is restricted to rural households that own or operate agricultural land. Workers are persons for whom farm hours are positive. Per capita expenditure for Ghana is expressed as a ratio to its mean, not so for Pakistan. This makes no effective difference to the tobit estimates since the variable is in logarithms and there is an equation constant.

**Appendix Table 2**  
**Variable Means for Workers and Non-Workers by Gender**  
**Rural Pakistan**

	<u>Boys in Pakistan</u>		<u>Girls in Pakistan</u>	
	<u>Workers</u>	<u>Non-workers</u>	<u>Workers</u>	<u>Non-workers</u>
<b><u># Observations</u></b>	191	427	200	365
<b><u>Dependent variable</u></b>				
hours worked on farm	25.6	0	14.9	0
<b><u>Child characteristics</u></b>				
age	12.2	11.6	12.0	11.8
first child	0.69	0.50	0.63	0.60
child of head of hh	0.85	0.78	0.87	0.79
<b><u>Household resources</u></b>				
In pc food expenditure	5.28	5.36	5.36	5.34
<b><u>Size of farm</u></b>				
acres of land	11.8	11.3	12.0	9.82
rent land?	0.13	0.15	0.16	0.16
sharecrop land?	0.48	0.33	0.43	0.30
<b><u>Household structure</u></b>				
household size	9.6	11.2	9.8	10.9
proportion female	0.43	0.43	0.53	0.55
female head?	0.03	0.01	0.045	0.014
age of household head	47.0	48.4	48.6	47.6
parents absent	0.021	0.012	0.0	0.025
males under 5 years	0.051	0.056	0.062	0.060
males 5-9 years	0.10	0.196	0.095	0.089
males 10-14 years	0.18	0.16	0.072	0.052
males 15-19 years	0.052	0.068	0.060	0.061
males 20-59 years	0.16	0.16	0.15	0.17
males over 60 years	0.027	0.028	0.033	0.026
females under 5 yrs	0.059	0.064	0.070	0.063
females 5-9 years	0.10	0.084	0.090	0.086
females 10-14 years	0.060	0.051	0.16	0.17
females 15-19 years	0.039	0.051	0.044	0.049
females 20-59 years	0.16	0.16	0.15	0.16
females over 60 years	0.014	0.021	0.0094	0.025
<b><u>Parents' education</u></b>				
mother none	0.98	0.97	0.99	0.94
mother primary or less	0.023	0.021	0.011	0.046
mother mid/secondary	0.00	0.008	0.00	0.012
father none	0.66	0.63	0.71	0.61
father primary or less	0.22	0.21	0.20	0.19
father middle	0.067	0.064	0.066	0.082
father secondary	0.056	0.092	0.020	0.12
<b><u>Community variables</u></b>				

<b><i>Access to school</i></b>				
boy's primary school	0.88	0.91	0.93	0.90
boy's middle school	0.44	0.44	0.38	0.41
girl's primary school	0.85	0.86	0.87	0.82
girl's middle school	0.28	0.28	0.25	0.26
local public transport <sup>1</sup>	0.66	0.62	0.60	0.62
<b><i>Farming technology</i></b>				
canal	0.69	0.53	0.63	0.61
rent for a tractor	77.5	78.7	78.9	80.3
<b><i>Economic infrastructure</i></b>				
shop	0.95	0.94	0.93	0.93
market	0.021	0.026	0.015	0.036
post office	0.63	0.60	0.63	0.61
telephone	0.37	0.39	0.41	0.38
<b><i>Regions</i></b>				
Punjab	0.50	0.47	0.42	0.47
Baluchistan	0.031	0.054	0.020	0.082
Sindh	0.31	0.26	0.39	0.21
Northwest Frontier	0.16	0.22	0.17	0.24
<b><i>Religion</i></b>				
Muslim	0.91	0.96	0.89	0.98
Christian	0.031	0.007	0.030	0.008
Non-Muslim	0.058	0.033	0.080	0.017

**Notes:** The sample is restricted to rural households that own or operate agricultural land. Workers are persons for whom farm hours are positive. An asterisk denotes the group that is omitted in running the regressions. <sup>1</sup>:Corresponds to the presence of a bus route through the cluster.