Is Child Work Necessary?

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Abstract

This paper investigates the hypothesis that children work because their income contribution is necessary for the household to meet subsistence expenditures. It uses the fact that a testable implication of this hypothesis is that the wage elasticity of child labour supply is negative. Previous work has tended to infer from a negative income elasticity that poverty drives children into work. It is argued here that a negative income elasticity only tells us that child leisure (or education) is a normal good. Using a large household survey for rural Pakistan, labour supply models for boys and girls in wage work are estimated. Conditioning on full income and a range of demographic variables, we identify a forward falling labour supply curve for boys, consistent with the view that boys work on account of the compulsions of poverty. This is less clear in the case of girls. Therefore, while raising the return to schooling for girls may draw them out of work, eliminating boys' wage work requires alleviation of the poverty of their households. Trade sanctions or bans on child labour may have deleterious consequences for these households unless they are compensated for the loss in income.

Keywords: child labour, education, poverty, gender, intertemporal labour supply.

JEL Classification: J22, J13, D12, O12

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1. Introduction

Why do children work? A common but not undisputed perception is that child participation in work is compelled by household poverty[1]. Indeed, both the geographic distribution of child workers today and the economic history of specific regions demonstrate a negative association of child work and aggregate income (for example, see the data in ILO, 1996a). However, it is unclear whether it was the rise in household incomes that eliminated child labour by dispelling the need for it, or whether the instrumental factor was the introduction of relevant legislation. This is because aggregate income may register an increase without any increase in the incomes of households supplying child labour. At the same time, economic growth or increases in aggregate income tend to be associated with the development of legal and political infrastructure, as well as with shifting and evolving social norms. In the last decade, microdata for developing countries have become available, which make it possible to disentangle household living standards (a microeconomic variable, which differs across households) from factors like new laws or changed norms, which apply equally across households.

Analyses of these microdata have produced a wide range of estimates of the effect of household income on child labour (and child schooling), a negative effect being interpreted as evidence that poverty is an important cause of child labour. However, a negative impact of income on child labour does little more than affirm the plausible belief that child leisure (or child schooling) is a normal good. In particular, we may expect to see a negative income effect in all households, not just in subsistence-poor households. We need additionally to know whether the income effect dominates the substitution effect before we can infer compulsions such as of subsistence. It is argued, therefore, that the hypothesis of poverty compulsions is better addressed by studying the wage elasticity. Suppose that households are very

[1] See this view expressed, though not established, in Grootaert and Kanbur (1995), Hamid (1994), US Department of Labor (2000), Basu and Van (1998) for example. In much of the recent theoretical work on child labour it is axiomatic that households providing child labour are poor. However, it is only Basu and Van (1998) that use precisely the notion of *how poor* (close to subsistence) that is invoked in this paper.

poor in the specific sense that income without child earnings falls below subsistence requirements, or that child work is *necessary*. Then a decrease in the child wage will result in an increase in child hours of work. For a fixed target, the wage elasticity will be –1 but, more generally, it will be negative. Section 4 formalises this by incorporating subsistence constraints in to a model of labour supply.

The hypothesis that we investigate in this paper- that children work because poverty constrains them to- does not appear to have been investigated elsewhere (see Section 2), though it is of evident interest and is axiomatic in Basu and Van (1998), the seminal theoretical paper on the economics of child labour. Yet this hypothesis is not without competitors. A competing hypothesis is that children work because the returns to school are relatively low, some evidence in favour of which is presented in the Probe Report (1999) for India. Evidence consistent with the poverty hypothesis has important policy implications. First, if poverty compels child work then trade sanctions or bans on child labour will tend to impoverish the already very poor households supplying child labour[2]. Second, the force of any interventions in the education sector is likely to be limited unless they also lower the opportunity cost of sending a child to school. Since the marginal utility of consumption increases very rapidly as people get close to subsistence[3], creating matching increases in the marginal return to education may not be in the scope of policy. In this case, addressing poverty is likely to dominate raising returns to education. On the other hand, if the wage elasticity is positive, indicating a substitution effect that dominates the income effect, then altering the relative return to education may make an impact on child labour. Overall, it is clear that investigating the hypothesis that poverty compels child labour is essential to determining whether public money committed to reducing child labour should be directed at *poverty* or at *school returns*. The first strategy has been adopted by the Food-for-Education Program in Bangladesh (see Ravallion and Wodon, 2000), `Progresa' in Mexico (refer Parker, 2001)), and Bolsa Escola and PETI in Brazil (see World Bank, 2001), all of which offer subsidies to households that send children to school to compensate them for the opportunity cost and, in the latter case, create income opportunities for their families. The second

[2] The recent surge in public interest in child labour has provoked debates on trade sanctions and the setting of international labour standards (e.g. Golub (1997), Fields (1995), Basu (1999), Bhalotra (1999)).

[3] This intuitive idea seems not to have exerted its power until recently. See, for example, Deaton (1997) in the context of the precautionary savings hypothesis.

strategy underlies the Back-to-School Program in Indonesia which has offered block grants to poor schools and scholarships to poor children towards the direct costs of schooling (see Sayed, 2000).

The data we use are from a representative household survey for rural Pakistan, a region where child labour participation is high, child *wage* labour is unusually prevalent and there is a striking gender differential in education and work. Labour supply equations are estimated separately for boys and girls, conditioning on a rich set of demographic variables and a lifecycle-consistent measure of household income. Both household income and the child wage are instrumented using community-level information. The main result is that the wage elasticity is significantly negative for boys and insignificantly different from zero for girls. These estimates are subject to a range of specification tests and emerge as robust. They are consistent with non-parametric estimates of the relation of wage rates and work hours, as well as with simple tabulations which show that working boys come from poorer households than working girls.

The paper is organised as follows. Section 2 surveys the relevant literature. A theoretical framework is outlined in Section 3. The data are described in Section 4 and the estimation strategy is discussed in Section 5. Section 6 describes the empirical model. The results are presented in Section 7 and Section 8 investigates their robustness in considerable detail. Section 9 offers further analysis and indicates directions for further research. Section 10 concludes.

2. Relevant Literature

The hypothesis that children work only when their parents' income is unable to sustain the household is referred to as *the luxury axiom* in Basu and Van (1998). More recent papers contain **theoretical** models that shift the emphasis from household poverty to the incompleteness of credit markets (e.g., Ranjan (1999), Lahiri and Jaffrey (1999)) or the imperfection of labour markets (e.g., Bhalotra and Heady, 2000), though poverty still plays a role. For instance, credit constraints are more likely to bind for the rural poor, both because their average incomes are low and because their incomes are particularly volatile. The **empirical** literature on child labour consists largely of reduced form participation equations that identify the correlates of child labour. There appears to be no research motivated to test well-specified hypotheses for why children work. The rest of this section presents a culling from the

available literature of the evidence on the relation of child labour with household poverty and child wage rates.

2.1. Income Effects

Case studies, which often select a sample of working children and which tend to report unconditional correlations, have produced mixed results. While some report a positive association of household poverty and child labour (e.g. Sharma and Mittar, 1990), others find no association (see Bhatty (1998), who surveys field studies of child labour in India). With the recent availability of large-scale microdata, several micro-econometric analyses of child labour have appeared in the literature. A number of these find that the participation rates of children are uncorrelated with household income, some find a positive coefficient on income and others find the expected negative effect[4]. *Overall, however, what emerges is that the income effect on child labour is small and often insignificant*. Income elasticities for a range of indicators of schooling are also, on average, small. Behrman and Knowles (1999) survey these studies and report a median elasticity of 0.07 (p.214), the elasticities typically being higher in poorer regions. An assessment of the evidence is difficult because most studies do not allow for measurement error or simultaneity bias, they use a range of definitions of income, and they tend to pool data across gender, region and types of child labour (or, in the case of schooling, they are often restricted to one indicator such as grade attainment). While both the endogeneity of household income in a child labour equation and measurement error in income will tend to bias its coefficient towards zero[5], the estimates remain small even after instrumenting income[6]. This raises questions not only about the poverty of households supplying child labour but

[4] An insignificant income effect is reported, for example, in Coulombe (1998, Cote d'Ivoire), Sasaki and Temesgen (1999, Peru), Patrinos and Psacharapoulos (1997, Peru), Ilahi (1999, rural boys in Peru); Ray (2000, Pakistan)). A positive coefficient on income is obtained, for instance, in Cartwright (1996, household farm/enterprise work in rural Colombia) and in Patrinos and Psacharapoulos (1994, Paraguay)). Negative income effects are found in Cartwright (1996, wage work in rural Colombia), Cigno and Rosati (2000, rural India), Ilahi (1999, rural girls in Peru), Rosati and Tzannatos (2000, Vietnam), Liu (1998, wage work in Vietnam), Ray (2000, Peru), Bhalotra and Heady (2000, boys in Pakistan and girls in Ghana, both in rural farm work)).

[5] In the case of measurement error, this is a standard result. In the case of endogeneity, what is meant is that the negative effect of income on child labour is made smaller by a positive simultaneity bias (more child labour means a higher household income).

[6] This is shown in this paper for wage work in Pakistan and in Bhalotra and Heady (2000) for farm work using data from the same source.

about household decision making and parental altruism, further discussion of which is deferred to Section 9.

Ray (2000) is the one paper that proposes, like this one, to directly test the "luxury axiom". The approach taken by Ray is to define an indicator variable for poverty that is unity for households with incomes below the poverty line. He includes this in a logit model for child work participation along with normalised household expenditure. He interprets a positive effect of the poverty indicator on child labour as evidence that poverty compels child labour. The specification is odd- including both the poverty indicator and expenditure as regressors allows a discrete jump in the income-work relation without allowing a change in slope. A more natural specification would be to interact the two variables, allowing poverty status to change the slope of the income-work relation. In any case, the claim that the children of the poor are more likely to work than the children of the non-poor is weaker than the claim that poverty compels child labour. Moreover, this procedure is sensitive to the choice of a poverty line, which is inherently arbitrary[7]. An advantage of the approach taken in this paper is that it avoids the problems of selecting a poverty line and assuming that there is a discrete jump in poverty status at that line. Instead, it allows the sign on the child wage rate to tell us whether the household is subsistence-poor by appealing to the idea that it is only in very poor households that a decline in the marginal return to work (relative to school or leisure) will increase the amount of work done by children.

2.2. Wage Effects

There appear to be no estimates of child wage elasticities in the literature with which those of this paper can compare. Most econometric analyses of child labour have estimated reduced form participation equations in which the wage does not appear as a regressor. In their studies of household production and time allocation, Levy (1985), Rosenzweig (1981) and Rosenzweig and Evenson (1977) find positive wage elasticities for child work force participation in the rural areas of Egypt and India respectively, but negative wage elasticities are ruled out by construction in their models.

[7] While the question of interest in this paper is that of procedures that one might use to test the hypothesis that poverty compels work, it may be worth adding that interpretation of Ray's

Turning from research on child labour to the larger literature on labour supply, there is some evidence of negative wage elasticities for adult men (see, for instance, Attanasio and MaCurdy (1997), Kniesner (1976) for the US, Kooreman and Kapteyn (1986) for the Netherlands), though these are typically found at high wage levels. Negative wage elasticities *at low wages* have been found for Mexico (Hernandez-Licona, 1996) and rural India (Rosenzweig, 1980) using data on adults. Looking at children here sharpens the question: Since the earnings of adults provide non-labour income for children, we would expect forward falling labour supply curves to be *less* likely to be observed for children than for adults.

3. A Theoretical Framework

This section sets out a model of labour supply which clarifies the role of the labour supply of household members other than the child, and the definition of household income. By introducing subsistence constraints, it defines the poverty hypothesis that is investigated in this paper.

We assume that children under 15 do not bargain with their parents because they do not have a valid fallback option. The unitary model of household decision-making used is consistent with the view that a "dictator" decides what labour, if any, the child will supply and also with the view that parents and children have common preferences. This is not nearly as unreasonable as the assumption of common preferences across spouses which has, in many contexts, been rejected in favour of the bargaining model. On the other hand, it may be important to allow the decision on child work to be influenced by the relative bargaining powers of the mother and father. Although our data do not contain variables such as individual assets (or "extra environmental parameters"- see McElroy, 1990) that can be used to denote these relative powers, our empirical model includes a dummy for female headship, allowing female heads of household to have different preferences over child labour than male heads. The education levels of both parents are also included as regressors to capture any effect of relatively well-educated mothers having greater power in household decision making. The child hours equation also contains an indicator for whether the child is the child of the household head, and this allows for differential treatment of nephews, siblings, or other relations of the head.

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results is additionally affected by the potential endogeneity of the poverty and expenditure variables in his analysis, which is not adequately addressed.

As a static model has limited appeal in the context of child labour, we adopt a multi-period framework. Assuming intertemporal separability, the problem can be decomposed into two stages. In the first stage, the agent allocates wealth (full income) across periods and, in the second stage, she conditions on full income and allocates consumption and leisure in view of their relative prices (see Blundell and Walker (1986), for instance)[8]. The second stage problem yields within-period marginal rate of substitution (MRS) conditions for the relative demands for consumption and leisure that are the same as in the static model but, as we shall see, household income, Y, is measured differently. Let subscript i denote the child in question and let j denote all other household members. Let instantaneous household utility be

$$(1)\ U=U(C, L_i, L_j, X, \varepsilon)\ ,\ C\geq 0,\quad L_i, L_j \geq 0$$

where U is concave and defined over joint consumption (C), individual leisure (L) and a vector of individual and household characteristics, some of which are observable (X) and some of which are not (ε). *Leisure* refers to non-market time and it therefore includes time spent at school or in activities other than wage work. The full income budget constraint is

$$(2)\ C + W_iL_i + \sum_j W_jL_j = Y + W_iT_i + \sum_j W_jT_j$$

where W are wage rates, T are time endowments (T≡L+H, where H is hours of work), Y is non-labour income, and the price of composite consumption, C, is the numeraire. All terms in (1) and (2) have the subscript t for the current period but this is suppressed to avoid clutter. It is introduced in (3) and (4) where more than one period is involved.

To define non-labour income, consider the intertemporal budget constraint defining the time path of assets (A):

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[8] These authors show that conditioning labour supply on the current period allocation out of lifecycle wealth is an alternative to the Frisch approach of Heckman and MaCurdy (1980) in which the conditioning variable that captures future anticipations and past decisions is λ, the marginal utility of wealth. It is a particularly attractive alternative when the data, as here, are limited to a cross section. This is because Y is observable in a cross section if data on consumption and income are available, while λ is not (see (4)).

(3) $A_{t+1} = (1 + r)A_t + \Sigma_k W_{tk} H_{tk} - C_t$

where r is the interest rate and k=i,j. Using (2) and (3), non-labour income is given by

(4) $Y_t = C_t - \Sigma_k W_{tk} H_{tk} = rA_t - \Delta A_{t+1}$, where $\Delta A_{t+1} = A_{t+1} - A_t$

Thus a lifecycle-consistent measure of Y counts in any asset accumulation or decumulation across periods (ΔA_t), which is an important way of smoothing consumption. In contrast, nonlabour income in the static model is simply rA_t, which is a valid measure only if agents are myopic or if there exist no capital markets so that it is impossible to save and dissave[9]. Of particular importance in this paper, conditioning on the correct measure of income is relevant to obtaining the correct wage elasticity. A one-period measure of income tends to generates wage elasticities that confound the effects of shifts in wage profiles with movements along them (see Blundell and MaCurdy, 1999). Measurement of lifecyle income with cross-sectional data is made possible by the equality established in (4)[10].

The first order conditions are obtained by maximising (1) subject to (4):

(5a) $U_c - \varepsilon_c = \lambda_m$

(5b) $U_{Li} - \varepsilon_i \geq \lambda_m W_i$

(5c) $U_{Lj} - \varepsilon_j \geq \lambda_m W_j$

where U_k denotes the marginal utility of k, λ_m is the marginal utility of money, and taste heterogeneity is introduced through the ε terms. The implied labour supply function for individual i (the child) in period t, given H=T-L, is

(6) $H_i = H_i (W_i, W_j, Y, X, \varepsilon) \leq T$

[9] While formal capital markets are underdeveloped in the rural areas of most low-income countries, there is considerable evidence of informal means of saving and dissaving (see Besley, 1996). The Pakistan data used in this paper reveal that between 43% and 50% of households reported borrowing or lending money in 1991.

[10] This measure of Y is in fact net dissaving- a *consumption based* measure of nonlabour income. The use of food consumption as a proxy for the unobserved marginal utility of

where the inequality is strict for an interior solution. So child labour depends on household income, the child wage, and the wage rates of other household members. We could equally transform the first order conditions to arrive at a conditional demand equation with child hours of work conditioned on parent hours of work (*quantities*) and non-labour income[11]. Since parent work hours are likely to be endogenous, we prefer the form in (6) which conditions on parent wages (*prices*).

3.1. Subsistence and The Wage Elasticity Of Hours Of Work

Let us introduce a subsistence constraint by defining $C^* \equiv C - C_s$, where C_s is subsistence consumption and C^* is the excess of consumption over subsistence. Since U is not defined for consumption levels below subsistence[12], C is replaced by C^* everywhere. Using (5) but suppressing the taste terms, we can write the marginal rate of substitution between consumption and child leisure, *f,* as

$$(7) \quad f(C^*, L_i) \equiv -\frac{\partial C^*}{\partial L_i} = W_i, \qquad C^*>0,\ L_i>0$$

Holding $\Sigma_j W_j H_j$ constant and taking total derivatives in (2) and (7) respectively yields

$$(8) \quad dC^* + W_i\, dL_i + L_i\, dW_i = dY, \qquad f_C\, dC^* + f_L\, dL_i = dW_i$$

We can obtain partial derivatives with respect to Y by setting $dW_i = 0$ and partial derivatives with respect to W_i by setting $dY = 0$. Using (7) and (8) now yields

$$(9) \quad \frac{\partial H_i}{\partial Y} = \frac{-f_C}{ff_C - f_L}, \qquad \frac{\partial H_i}{\partial W_i} = \frac{1}{ff_C - f_L} + H_i \frac{\partial H_i}{\partial Y}$$

where f_C and f_L are the partial derivatives of f with respect to its arguments, the first term on the right hand side is the *pure substitution effect* (>0) and the second term is

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money, as in Altonji's (1983) analysis of multi-period labour supply decisions of American men, is in the same spirit.

[11] This conditional model is estimated in Bhalotra (2000a) where the focus is on investigating separability of parent and child labour supply and consequences for the size of the income effect.

[12] And for $W_i < (C_s - Y - \Sigma_j W_j H_j)/T_i$, the labour supply curve is not defined.

the *income effect* (<0 if leisure is normal). So we have the familiar result that the slope of the labour supply curve depends upon which of these effects is larger.

In order to derive conditions under which the relative strength of these effects can be assessed, we need to impose some structure on the utility function. If $f(C^*, L)$ is restricted to be homothetic, so that $f=g(C^*/L)$ then (9) becomes

$$(10)\ \frac{\partial H_i}{\partial W_i} = \frac{1}{W_i}\frac{L_i}{C^* + WL_i}[C^*(\sigma - 1) + (Y - C_s)]$$

where σ is the elasticity of substitution between net consumption and leisure, and $\sigma=1$ in the Cobb-Douglas case[13]. Multiplying by (W_i/H_i) in (9) and substituting out H_i using $H_i=[C_i^* - (Y-C_s)]/W_I$ (got by rearranging (2a)), we get an expression for the wage elasticity,

$$(11)\varepsilon_w \equiv \frac{\partial H_i}{\partial W_i}\frac{W_i}{H_i} = \frac{W_i L_i[C^*(\sigma - 1) + (Y - C_s)]}{[C^* + W_i L_i][C^* - (Y - C_s)]}$$

It follows directly from (11) that when household consumption is at the subsistence level ($C^*=0$), then $\varepsilon_w = -1$. This is consistent with the intuitive notion of the child working towards a target income where the target is defined as the shortfall between subsistence requirements and other household income. Suppose that households are not exactly at subsistence but are nevertheless very poor. Then C^* is not zero but close to zero and the first term in square brackets in (9) is close to zero for all values of σ. In this case, as long as the non-labour income of individual i (the child) falls below subsistence requirements ($Y<C_s$), $\varepsilon_w<0$: given subsistence constraints, the income effect of a wage change will tend to dominate the substitution effect for very poor households[14].

We might further assume that σ is constant. The MRS for the more commonly used CES function is

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[13] The derivation of (10) under homotheticity is detailed in the Appendix to Barzel and MacDonald (1973).

[14] And if $Y \geq C_s$, $\varepsilon_w>0$, as long as $\sigma \geq 1$.

$$(12)\ f(C^*, L_i) = \frac{1-\alpha}{\alpha}\left(\frac{C^*}{L_i}\right)^{1/\sigma}$$

At $C^*=0$, it follows from (12) that f_C is infinite[15], and we obtain from (7) and (9) that

$$(13)\quad \frac{\partial H_i}{\partial W_i} = -\frac{H_i}{W_i}$$

from which it follows again that $\varepsilon_w = -1$. At C^* close to zero, f_c is very large and we can see from (9) that the wage elasticity for positive H_i is negative.

We are now in a position to explicitly define the hypothesis that is investigated in this paper. The strong form of our *poverty hypothesis* is that households are "subsistence poor" in the specific sense that income without child earnings falls below subsistence requirements. Its weaker form is that households are poor enough that the income effect of a change in the child wage dominates the substitution effect, other things being equal. We therefore estimate (6) using income defined in (4) and use estimates of the wage elasticities for boys and girls (with reference to (11) or (13)) to test the poverty hypothesis[16].

The strong form of our poverty hypothesis is equivalent to the luxury axiom in the seminal paper of Basu and Van (1998). This paper presents a method for empirical verification of that axiom. Basu and Van denote household poverty by the adult wage rate in order to focus attention on an interesting configuration of labour market equilibria. We generalise this by characterising household poverty as dependent on adult earnings, non-labour income and any saving or dissaving performed by the household (see equation (6)). The generalisation is of great practical importance income from self-employment tends to dominate labour income in many developing country households and because there is typically huge inequality in asset (especially land) distribution.

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[15] This is best seen by differentiating the logarithm of f with respect to C.

[16] It is worth underlining this: The poverty hypothesis is that if households are very poor then we will observe a negative wage elasticity. Conversely, finding a non-negative wage elasticity implies rejection of the poverty hypothesis. We cannot and do not claim that finding a negative wage elasticity implies extreme poverty. [If A⇒B then not-B⇒not-A. However, it does not follow, of course, that B implies A.]. Also see Section 9.

4. Data and Non-Parametric Statistics

4.1. The Data

The data are the *rural* observations from the Pakistan Integrated Household Survey (PIHS) which covered 2400 households in 1991. They are available from the Living Standards Measurement Survey unit of the World Bank. Children are commonly defined as persons under 15 years of age (e.g., ILO, 1996b). Since employment questions in our survey are only addressed to individuals ten years or older, we model the labour supply of *10-14 year olds,* distinguishing *boys and girls.* Pakistan has very low levels of school enrollment, even in comparison with other low income countries, and its child workforce participation rates are among the highest in the world (ILO, 1996b). Also, in comparison with sub-Saharan Africa or with neighbouring India, Pakistan has a large fraction of children in *wage* work. This paper concentrates on children in wage work for the following reasons[17]. First, data on wage rates are directly available for these children whereas including children engaged in family farm/enterprise work in this analysis would require estimation of the shares of individuals in the household in their joint income (see Section 9.1). Second, wage labour involves longer hours than other forms of child labour and, in Pakistan, it rules out school attendance (Section 4.3). This makes it the form of child labour that is of greatest concern. Third, the determinants of market work and of work on family farms/enterprises are likely to be different, and estimating models in which hours are aggregated over types of work is prone to yield biased parameter estimates. Similarly, to avoid pooling rural and urban data, we restrict our sample to rural areas where child work and poverty are most prevalent.

4.2. Participation Rates in Work and School

Table 1 presents a profile of activity rates. The sample probability of a girl being engaged in wage work is twice as large as that for a boy: 6% of boys are in wage work, and 12% of girls[18]. These participation rates are high for a rural economy where self-employment still dominates wage employment though the latter is growing.

[17] The employment of children on household farms in rural Pakistan (and Ghana) is analysed in Bhalotra and Heady (2000), where the focus is on the role of land ownership in determining child labour.

[18] These data challenge the view that Islamic girls do not venture out of the home. On the other hand, at age 15, the participation rates of girls in wage work drop and are exceeded by the rate for boys.

Comparing these figures for children with the corresponding figures for adults puts them in perspective. Amongst adults (18 years and older), 36% of men and 15% of women are wage workers.

Possibly the most striking feature of the data in **Table 1** is the gender gap in school attendance. Only 31% of girls attend school as compared with 73% of boys. This is reflected in the higher workforce participation rates of girls in both household farm/enterprise work and wage work. A further interesting feature is the large fraction of children that report no activity: 14% of boys and 42% of girls. "No activity" is likely to correspond to heavy engagement in domestic chores such as cooking, cleaning, caring for siblings and fetching fuelwood and water. Existence of the no-activity category underlines the fact that one needs to be careful about assuming that actions which release children from work will also put them in school.

In view of the gender difference in the results of this paper (Section 6), I investigated the gender difference in school attendance amongst these children by estimating returns to schooling for adult men and women in rural Pakistan. While the returns to school for women are close to zero for low levels of education, they are high at high levels of education. However, of rural women, 93% have no education. The more interesting finding is of the effect of schooling on employment: every year of education *reduces* the probability of work participation by 4 percentage points in any-work (mean participation rate=57%) and by 1.1% points in wage work (mean=15%). Casual consultation with local people confirms this: if a woman in Pakistan works, it is a sign of hardship. While Islamic culture may have something to do with this, it cannot be the only explanation since, in rural Bangladesh which is also predominantly Muslim, 74% of boys and 75% of girls aged 5-16 were in school in 1995-6 (Ravallion and Wodon, 2000)[19]. Relevant differences in Bangladesh are the greater empowerment of women (reflected in a steeper decline in fertility, for example), the much greater NGO activity and, overall, possibly the recognition that there are non-pecuniary private benefits to women's education, including effects on fertility and child wellbeing. For our current purposes, however, what is clear is that there is not much of a private pecuniary gain to sending a daughter to school in Pakistan since she is unlikely to reap rewards on the labour market.

[19] Rural Ghana also has a large Muslim population but, in 1992, 74% of 10-14 year old girls were in school as compared with 81% of boys of the same age. In many developing countries (e.g. Peru, South Africa), the school enrollment rates of girls exceed those of boys.

4.3. Work Hours and Competing Activities

Mean hours of wage work are 45 a week for boys and 31 a week for girls (**Table 2**). There is considerable variation around this mean, which is exploited in estimating the wage elasticity. **Figure 2** shows kernel density plots of work hours. The bi-modality is consistent with a concentration of the data around "part-time" and "full-time" work but there is a spread around these points. Given the high commitment of time that wage work appears to require, it is unsurprising that virtually no children combine it with school attendance. The sample probabilities of combining different activities are presented in **Table 1**. While some children do combine farm work with either wage work or school, this is not as common as in sub-Saharan Africa (see Bhalotra and Heady (2000), Canagarajah and Nielsen (1999), for example).

4.4. Child Labour and Household Living Standards

Do the data suggest a negative relation of child labour and household living standards? To explore this, we use current household consumption expenditure per captia (C), since this is expected to be smoother than current income. Consider **participation rates** first. Simple tabulations show that, amongst boys and girls alike, C is lower for workers (at Rs. 430) than for non-workers (Rs. 525). Deducting the child's contribution would only reinforce this result. Amongst child workers, C is lower in the sample in wage work (at Rs 359) as compared with those that are employed on the family farm/enterprise (Rs. 448).

Table 2 presents work and school participation rates by quartiles of household expenditure and these data are portrayed in **Figure 1**[20]. For wage work, the data support a positive relation of child work and poverty. They also suggest that the burden of household poverty is born disproportionately by girls, or that the income effect on child labour supply is stronger for girls than for boys. Amongst the poorest 25% of rural households, a remarkable 19% of girls are in wage work as compared with 8% of boys. In the richest 25% of households, the participation rate falls to 9.4% for girls and 5% for boys. As before, if expenditure were adjusted for the income

[20] The poverty line is just above the mean expenditure per capita of the lowest quartile. Thus households challenged to meet subsistence requirements are expected to be in this group. Malik (1995) estimates the poverty line for 1990-1 for rural Pakistan to be Rs. 243 per capita, using calorie-expenditure functions estimated on the Household Income and Expenditure Survey which has a similar sampling frame to the survey that we use (the PIHS).

contribution of children, the poorest households, amongst whom child work is more prevalent, would appear even poorer. The pattern we observe across quartiles is therefore unlikely to be altered. Work on the family farm/enterprise is less closely associated with poverty and, in the case of girls, the relation appears perverse[21]. School attendance appears to be increasing in income though the rate may be deemed modest. Now consider the relation of household expenditure with **child hours** of work conditional on participation. The data in **Table 2** suggest this is non-linear. This is confirmed in **Figure 3** which presents non-parametric estimates of this relation obtained using a Gaussian kernel. Consistent both with the participation data and with the results reported in Section 7, obtained after conditioning on a range of variables, the expected negative relation of household living standards and child hours of work is clearer for girls.

Overall, the data support a broadly positive relation of poverty and child labour but it is not as striking as one may have expected. The analysis in this paper will investigate this further (see Sections 2 and 9). As discussed in Section 1, the child wage elasticity is the more relevant statistic for the hypothesis at hand and this is what we turn to consider now.

4.5. Child Labour and The Child Wage

A two-way scatter plot of hours and the wage rate for children in wage work is in **Figure 4,** and the fitted line is a cubic spline. The graph reveals a negative relation for boys and no relation of the two variables for girls. Although the plot is only indicative because non-labour income and other variables have not been held constant, we shall find that the unconditional correlation observed here persists after conditioning on income and a range of other covariates.

5. Estimation Strategy

The dependent variable is hours of work conditional on participation because it is only on the intensive margin (continuous changes in hours of work) that the wage elasticity of labour supply can be negative. If I_h is an indicator variable for participation in work, then observed hours, H, are given by $H=H^*$ if $I_h=1$ and $H=0$

[21] This "wealth paradox" is explored in Bhalotra and Heady (2000). The intuition is straightforward: consumption will tend to be higher in households that own large plots of land. The wealth effect of land ownership will tend to reduce child work but ownership of land (and other productive assets) also increase the incentive to work and this may be a compelling factor if labour markets are imperfect.

otherwise. To control for selection bias, the inverse Mills ratio (λ) estimated from the work participation equation is included as a regressor in the hours equation (Heckman, 1974). To increase the robustness of this procedure to the assumed parametric distribution of the unobserved error terms, λ^2 is also included in the model. This approach rests on the semiparametric series estimator principle of Newey, Powell and Walker (1990)[22]. Identification is achieved on demographic variables which explain participation but are confirmed to have no power to explain hours conditional on participation.

5.1. Instrumental Variables

This section discusses the reasons to instrument income and the child wage, as well as the procedure, the instruments and the tests employed. The availability of cluster-level information offers us a choice of instruments[23]. We follow Hausman (1978) and Smith-Blundell (1986) and specify auxiliary models for income and the child wage and include the estimated residuals from these equations in the model for child hours. The significance of the residual provides a *test of exogeneity*. *The strength of the instruments* is measured by an F-test on them in the auxiliary (first-stage) equation. We present OLS estimates for comparison with the IV estimates. This is important because weak instruments can yield inconsistent estimates. Indeed, Bound, Jaeger and Baker (1995) show that the inverse of the F-statistic is proportional to the bias in the second stage (also see Staiger and Stock (1994), Nelson and Startz (1990)).

Our lifecycle-consistent measure of *household income (Y)* is endogenous by virtue of being defined by (past) consumption and leisure choices. Decisions on how much to consume or how much to borrow are likely to be made jointly with the decision of how much children work. Income is also notoriously difficult to measure

[22] Using US data, Newey, Powell and Walker (1990) investigate the robustness of estimates of women's labour supply to the normality assumption. They find no statistical difference between the conventional 2-step Heckman estimates and semi-parametric estimates obtained using the series estimator. They also find that semiparametric estimates of the first stage participation equation are not significantly different from ML estimates. They conclude, in line with Mroz (1987), that the sensitivity of estimates of the hours of work model for women in the US depends more upon correct specification of the regression function and the choice of instrumental variables than on specification of the error distribution. In this paper, particular care is taken to investigate the robustness of the specification for child labour supply (Section 8).

[23] Clusters are the survey sampling units one level above households and they roughly correspond to rural communities. Having more than one instrument is very useful: Card (1994) highlights the problems that may arise when a single instrument is used.

accurately, especially in rural economies. Our measure of income (see (6)) is obtained by taking the difference of consumption expenditures and household labour income, and differencing will tend to increase the noise-signal ratio[24]. Available instruments for Y are cluster-level variables including the going agricultural wage rate for men, indicator variables for whether the cluster has a shop, a market, a bus running through it, a canal, electricity, and water supply, and the cluster-level average of Y. Tests of overidentifying restrictions reject some of these and we retain a smaller set.

The coefficient on the child wage is subject to endogeneity bias if, for example, unobservables like laziness (tastes for work) are negatively correlated with both the wage and work hours of the child. In addition, calculation of the wage as the ratio of earnings to hours tends to introduce "division bias", a spurious negative correlation between the wage and hours (which is bigger, the bigger the measurement error in hours). Finding a valid instrument for the wage in a labour supply equation is a difficult problem. Estimates of adult labour supply equations in the literature are often obtained by instrumenting the wage with education (for example, Fortin and Lacroix (1997), Kooreman and Kapteyn (1986), Hernandez-Licona (1996)) on the arguable assumption that education does not affect preferences for work (see Pencavel, 1986). This assumption may be especially strong when the data refer to children. This paper therefore uses the going agricultural wage rates for men and children at the cluster level as instruments for the child wage. To increase the predictive power of the first-stage regression, we investigate the validity of using completed school years of the child as an additional instrument. A test of this overidentifying restriction rejects education in the case of girls though not in the case of boys, and it is therefore dropped from the girls' wage equation.

[24] Let C^* denote true consumption and E^* denote true total labour earnings in the household and let these variables be measured with random errors denoted u and e with variances σ_u and σ_e. The measured variables are then $C=C^*+u$ and $E=E^*+e$. The lifecycle measure of Y is defined as (C-E) which equals $(C^*-E^*)+(u-e)$, where $var(u-e)=\sigma_u+\sigma_e-2cov(u,e)$, which we suspect is larger than σ_u, the variance of the measurement error when household living standards are measured simply by consumption, C, rather than by net dissaving, Y. At the same time, the signal in (C-E) is diminished to the extent that C and E tend to be close to each other. As a result, the noise-signal ratio is expected to be larger for Y than for C. This strengthens the case for instrumenting income.

6. The Empirical Model

This section translates the theoretical model in to an estimable model, subject to constraints imposed by the data. The sensitivity of the results to some of the choices made here is investigated in Section 8. Two definitions of *hours of child wage work,* H_i, are constructed from the survey. One refers to the week before the survey and the other to the annual average of weekly hours of work. **Tables 1** and **2** use the first definition. The analysis to follow reports results using both definitions. The *child wage rate,* W_i, is measured as earnings divided by hours of work[25]. Measurement of earnings is complicated by some payments being made in kind and by earnings being reported for different payment frequencies. These were brought to a common denominator and payments in kind were incorporated using cluster-level grain prices and information on quantities of grain received.

The wage rates of other household members, W_j, are calculated in an identical fashion. However it is not uncommon in these data to find that a child is in wage work but one or both of her parents are not. The parents may, for example, work on the household farm[26]. As a result, W_j records many missing values. There are two ways of dealing with this problem. One is to predict W_j using the sample of adults for whom wage data are available. The other is to replace the wage rate of person j with the age and educational level of person j. Both methods were implemented but the second is preferred because it is cleaner and because the impact of *parents' education and age* on child labour is of independent interest. Since children in rural areas typically live in large integrated households, j goes up to 7 for the average household. For simplicity, we include only the W_j (age and education) of the child's parents. The labour supply of other adults and siblings is "represented" in Y (see (6)). Formally, this amounts to assuming separability of the leisure of these individuals from the

[25] Note that the wage rate is specific to the individual child – it is not constrained to be the local market wage - which is available and used as an instrument.

[26] For boys in wage work, 52.5% of fathers and 75.4% of mothers do not report a wage. For girls in wage work, 70% of fathers and 26% of mothers do not report a wage. (Notice the strong suggestion of complementarity in mothers' and daughters' involvement in wage work- investigated in Bhalotra, 2000a). Is this because of specialisation (risk-diversification) within the household or does it suggest that children are only put in to wage employment when their parents cannot work, for example, on account of illness or disability? This is what the data say: 73% of fathers and 55.3% of mothers of wage working children are engaged in work on the household farm or enterprise. For comparison, for the sample of children engaged in farm/enterprise work, 82% of fathers and 82% of mothers are also engaged in farm/enterpise work.

leisure of the child[27]. To investigate whether this makes any significant difference, parents' education and age was replaced by the average education and age of all adults in the household- this did not alter the wage and income elasticities. The omission of sibling terms as regressors is partially addressed by grouping siblings, a specification which is discussed in Section 8.

The lifecycle-consistent measure of non-labour income, Y is defined in (6) as $(rA_t-\Delta A_{t+1})=(C_t-\Sigma_k W_{tk}H_{tk})$. This equality, which flows directly from the budget constraint, shows that information on asset changes is not necessary and that Y can be measured with cross-sectional data as long as they contain household consumption (C) and the labour income of all household members ($\Sigma_k W_k H_k$), which the survey we use does.

Recall that the child may be engaged in any of the following activities: wage work, work on the household farm or enterprise, school, or none of the above (Table 1). Therefore, *exogenous regressors, X*, include variables that determine the relative attractiveness of these activities. For example, we include acres of land owned by the household which, at given household size, reflects the marginal productivity of farm/enterprise work. Rosenzweig (1980) presents formal models of labour supply in landholding and landless rural households and he underlines the importance of conditioning on farm size when analysing wage labour, something that many existing empirical studies of child labour do not do. To proxy the cost of school attendance, we include dummy variables for the presence of primary, middle and secondary school in the village. The vector X also includes a quadratic in child *age,* a dummy indicating whether the child was *ill* in the month preceding the survey and dummies for *female-headship* and *religion*[28].

We include the cluster-level *unemployment rate* (calculated by aggregation of individual responses) to allow for disequilibrium in the labour market. The common practice of excluding it from labour supply models results in mis-specification (see Ham 1986, Card, 1988). The equation also includes *province dummies* that will pick up more aggregate regional effects including demand effects.

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[27] Many analyses of labour supply and certainly all analyses of child labour assume separability for all household members. We relax this assumption for parents, holding on to it for pragmatic reasons for other individuals.

[28] *Household size*, indicators of the *age-gender composition* of the household, *birth-order* dummies and dummies describing the *relation* of the child to the household head (child,

6.1. Functional Form

A flexible functional form which permits negative curvature of the labour supply curve at low wages *and low levels of household (nonlabour) income* is

$$(14)\ H_i = \alpha + \beta \ln W_i + \gamma_1 Y_i + \gamma_2 Y^2_i + \theta(\ln W_i)(Y_i) + \delta X_i + e_i$$

where X_i incorporates all exogenous variables and the interaction term between Y_i and W_i allows the wage elasticity to vary with the level of household income. We expect $\theta>0$[29]. The wage elasticity is $\partial \ln H_i^* / \partial \ln W_i = (1/H_i)[\beta + \theta Y_i]$. Of course if $\theta=0$, the poverty hypothesis in its weak form is simply $\beta<0$ and, in its strong form, it is $\beta/H_i = -1$. The semilog-linear form may be thought to provide a local linear approximation to a range of more complex functions. Since Y (net dissavings) can take negative values, it cannot be logged. Amongst labour supply studies that use lifecycle models, some specify a Stone-Geary or CES utility function and this results in the term (Y/W) in the model, which provides a normalisation of Y (see Blundell, Duncan and Meghir (1994), for example). A difficulty with adopting this specification in this paper is that it restricts the wage elasticity to be more negative at *higher* levels of income, contrary to what we would expect in rural Pakistan.

7. The Main Results

The preferred estimates (see **Table 3**) are discussed in this Section. Section 8 investigates the robustness of these results by considering a range of alternative specifications. There is considerable variation in hours around the mean, a good deal more than is typically observed for adult hours of work in industrialised nations (see **Figure 2**). The specified model explains about 65% of this variation for boys and

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nephew, etc) were included but these are not retained because they were insignificant. They help identification of the participation-selection term.

[29] If we were interested in investigating the possibility that the adult labour supply curve bends backwards in a population where living standards are well above survival levels, we would include a quadratic in the wage. This would allow the adult wage elasticity to change sign with the level of the wage rate. In our context, the parallel argument is that the *child* wage elasticity may change sign with the level of household income (and therefore, possibly, with the *adult* wage rate). Thus the interaction term between household income and the child wage is the sensible analogue, in this context, of a quadratic in the own-wage.

girls. Estimates of wage and income elasticities of hours of work tend to be close to zero in developed countries, particularly for men, the participation decision exhibiting greater responsiveness (e.g., Heckman, 1993). The labour supply elasticities for hours of work of children in Pakistan that are identified here are, by this criterion, fairly large.

The **wage elasticity** is significantly negative for boys and is estimated to be –0.33 at the sample means. Alternative specifications set the range as –0.3 to –0.6 (or as –0.3 to –1.4 with IV estimates, see Section 8), so the preferred estimate of –0.33 is a conservative one. Girls exhibit a wage elasticity of –0.05 that is insignificantly different from zero. *We therefore cannot reject the weak form of the poverty hypothesis for boys, and the IV estimates support the strong form.* The data are consistent with the view that boys are in work because their labour income supports subsistence needs of the household. If a boy's wage rate drops, he works harder to make up the loss in earnings. Conversely, if his wage rate increases, rather than exploit the higher marginal reward for effort on the wage labour market, he works less. The income effect of a change in his wage dominates the substitution effect. As the wage elasticity is insignificantly different from zero for girls, we cannot reject the null hypothesis that it is negative. However, since it is not significantly negative, it is not clear that households sending girls into wage work do this predominantly because the additional income is necessary to meet needs. For example, a wage elasticity of zero is also consistent with the hypothesis that parents are selfish if selfishness is implicitly defined as sending a child to work the maximum feasible hours, irrespective of the marginal return (the wage). What is clear from the gender differential in the wage elasticity is that household poverty is a stronger factor in determining child labour amongst boys' than amongst girls. This is corroborated by the raw data: see **Table 5,** which confirms that households with working boys are poorer on average than households with working girls.

Household income has a significant negative impact on child work, of rather smaller magnitude than we may have expected. Further discussion of its size is in Section 9. The elasticity for girls is twice as large as for boys. This is consistent with the data described in **Figures 1 and 3** and with the findings of other studies (e.g. Ilahi (1999) for child labour in rural Peru, Behrman and Knowles (1999) for schooling in Vietnam). It may be interpreted as girls' schooling being more of a luxury than boys' schooling.

Many of the *control variables*, while significant in the reduced form participation equation, are insignificant in the hours equation (and this assists identification). The quadratic in the Mills ratio included to correct for selection of working children is insignificant in both equations, taking a positive sign for boys and a negative sign for girls. It is worth reiterating that estimation of hours equations conditional on participation in this paper is not motivated by an inherent interest in the variation in hours in the data (though this is substantial enough to stimulate interest). Rather, it is a method of eliciting from the data the relative sizes of the income and substitution effects of a wage change which provide useful information on why children work. Of variables significant in the hours model, interesting results pertain to access to schooling which reduces boys' hours, and farm size which reduces girls' hours in wage work. This indicates that the alternative to wage work is school attendance for boys whereas, for girls it is not school as much as farm work (also see Section 4.2).

8. Investigating Robustness

How robust are these estimates? Comparable estimates of labour supply equations are unavailable in the literature (see Section 2). Wage and income elasticity estimates for adults in industrialised countries have exhibited great variation, stimulating research directed at identifying the important specification errors in modeling labour supply (see Heckman (1993) for example). Differing assumptions regarding selection bias, simultaneity or measurement error biases, and functional form have been shown to yield wildly differing estimates for the same population (e.g. Mroz (1987)). While the preferred specification was carefully chosen (see Sections 5 and 6), we now investigate alternative specifications (Table 3) and definitions (Table 4).

1. Instrumental Variables Estimates

Details of the procedure for *instrumenting income and the wage* are in Section 5. We are unable to reject the null of exogeneity of income for either boys (t=0.49) or girls (t=0.84). For girls, we cannot reject the exogeneity of the wage either (t=0.31). However, for boys, wage exogeneity is rejected (t=2.2)[30]. *The IV wage elasticity for*

[30] This refers to the equation with the full set of control variables. In the parsimonious version containing just the wage and income, the t-statistic on the residual from the auxiliary wage equation is 0.66.

boys is not significantly different from –1, which supports the strong version of the poverty hypothesis. Tests of overidentifying restrictions were unable to reject the instruments that are used. However the instruments are not very powerful: The F-test on the instruments in the first-stage income equation has a p-value of 0.09 in the case of boys and girls. The instruments in the first-stage wage equation have p-values of 0.12 for boys and 0.10 for girls. While the instruments appear valid, we report the OLS estimates as preferred because the instruments are not very strong and because OLS provides the lower and therefore more conservative estimate of the wage elasticity[31].

2. Adult Wage Elasticities

The theoretical basis for a negative wage elasticity rests on the individual not having sufficient non-labour income to fall back upon if she reduces her labour supply (Section 3). It is reasonable to think that a child can fall back not only on household assets but also on parental income. It would be unusual that parents fall back on child income to the same degree. Therefore, if we find a negative wage elasticity for children, we should expect a negative wage elasticity for adults. As a check on the coherency of our results, this is investigated. And it is confirmed: The wage elasticities for male (-0.29) and female (-0.20) adults are similar to those for boys. The income elasticity for men is insignificant and for women, at –0.16, it is much the same as that for boys, and significant at 1%.

3. Occupational Rigidity

Is the negative wage elasticity simply a reflection of low wage jobs being associated with (packaged with) long hours? To control for this possibility, *dummies for type of wage work* -seasonal agriculture, permanent agriculture and non-agricultural- are included as regressors. The seasonal work dummy is, plausibly, negative and significant. The wage elasticity for boys falls from –0.33 to –0.25, remaining significant at 5%, and it is unchanged for girls.

[31] The simultaneity biases in both income and the wage are expected to be positive. So instrumenting is expected to make both coefficients more negative. This would only *strengthen* the main conclusion of the paper.

4. Substitution Across Types of Work

Might a negative wage elasticity for wage work reflect an inferiority of wage work as compared with alternative types of work? In Section 3, we reported averages from our data that indicate that households supplying child wage labour are poorer than households in which children work on the household farm or enterprise. This is therefore a fair question. Since market wages are positively correlated with marginal returns to work on the household farm/enterprise (and, in a perfect labour market, they are identical), an increase in the wage will reflect an increase in the return to both types of child work. If wage work is inferior then an increase in the child wage, and the resultant income effect, may create a shift of children from wage work to "household" work. This would show up as a negative wage elasticity in our estimates. This is reinforced if parents resort to using family labour on their farm when hiring-in workers becomes more expensive. To check whether this is what drives our estimate of a negative wage elasticity, the equation is re-estimated with *the dependent variable defined as the sum of hours spent in wage and household farm/enterprise work*. The wage elasticity for boys, at –0.41, is now larger and still significantly negative.

5. Labour Demand vs Labour Supply

The negative relation of work hours and the wage is unlikely to reflect labour *demand* rather than labour *supply* because these are individual level data, and demand effects are captured by province dummies and the village-level unemployment rate. Also, as we have just seen, the result for boys persists and is even stronger when the actual wage is replaced by the offered wage.

6. Income-Dependence of Wage Elasticity

If we could establish that the observed tendency for boys to maintain their earnings in the face of wage changes is more pronounced in lower-income households, this would support the interpretation of a negative wage effect in terms of subsistence constraints. Ideally, the equation would be estimated on subsamples of the data corresponding to different expenditure quartiles. Since the numbers of working

children are too small to permit this[32], *an interaction term* between the child wage and household income is included as an additional regressor (see Section 6.1). It acquires the expected positive coefficient but it is poorly determined for the gender-specific samples of 10-14 year olds. Increasing sample size by estimating the equation for 10-17 year olds makes this term significant at 10%: as expected, the wage elasticity is more negative for poorer households.

7. Siblings

The preferred model is estimated for individual children. We also investigate the *average response for all children within a household*. Defining the dependent variable as average hours per child in the household and the child wage as an average weighted by hours, we find a wage elasticity for *all-boys-in-the-household* that is –0.14 and, for *all-girls,* that is insignificant. The income elasticities show no significant change. These results broadly parallel the preferred results though they are, of course, not strictly comparable. Aggregating over *boys and girls* within households produces a wage elasticity of -0.12. A striking result here is that the income elasticity rises to a healthy –0.51 once we average over all children in the household.

8. Robustness to Controls, Definitions & Functional Form

Results are in Table 4.

Control variables: In addition to the child wage (W), household income (Y, Y^2) and corrections for endogeneity and selection, the estimated equations include a set of individual, household and region level variables described in Section 6. Since some of these are likely to be correlated with the key variables of interest (e.g., child age with child wage, acres of land owned by household with net dissaving (income) of household), a *parsimonious equation* is estimated with just W, Y, Y^2 and λ. There is no statistically significant change. For boys and girls alike, the wage elasticity is slightly larger in absolute size.

Age-range of children: The age range is widened to include all 10-17 year-olds, primarily to increase the size of the sample of child workers. Our data show that

[32] Future research should investigate the hypothesis in this paper using data for a big country like India or Brazil rather than for a relatively small country like Pakistan! This will not only permit wage elasticities to be estimated by income group but is also likely to produce more precise estimates of coefficients on the explanatory variables as well as on the selection and endogeneity correction factors.

the proportion in school falls gradually after the age of 11 and exhibits a sharp drop from 31% at age 17 to 17% at age 18. We therefore select a data-consistent cut-off at age 17. The wage elasticities turn out to be robust to widening the age definition of children. Consistent with expectation, the income elasticity is smaller for 10-17 year olds as compared with 10-14 year olds.

Measure of hours of work: The dependent variable in the preferred equations is the annual average of weekly hours in wage work. This is preferred because it averages over the agricultural seasons. Estimates using hours of wage work in the week before the survey are also presented. The wage elasticities for boys and girls record no significant change.

Measure of household income: The lifecycle-consistent specification of income (net dissaving) that is used in the main equations is defined in equation (6). We investigate the sensitivity of the wage elasticity to changes in the measure of income used. *(a)* First, we use consumption per capita which is simpler than net dissaving and yet may be expected to capture lifecycle-effects. *(b)* A further alternative that is explored is to use reported labour income of household members other than the child, and asset income. The wage elasticity is robust to these alternative specifications. For both boys and girls, it is insignificantly smaller under *(a)* and larger under *(b)*. These models are not preferred because, as discussed earlier, conditioning on a static measure of income can bias the wage coefficient.

Functional forms: The preferred model is the semi-log, primarily because it yields the more conservative estimates of wage elasticities for our data. The *log-log* specification yields a larger wage elasticity of *–0.58* for boys, while that for girls is unchanged. We also estimate a *tobit* model (involving children not in work) in place of the preferred model for hours model conditional on participation. The produces a wage elasticity that is negative and significant for both boys and girls.

9. Discussion

This section comments on the method and the results and points to directions for further research.

9.1. Wider Applicability of the Method

Although we restrict our analysis to children in wage work in Pakistan (see Section 4.1.), the method we propose has wider applicability. Children engaged in work on

the household farm or enterprise are typically not paid a wage but their marginal productivity (or shadow wage) can be estimated from a farm production function (see Jacoby (1993) for an illustration in the case of Peru). Another option is to use the community-level child wage rate that is collected in most integrated household surveys for developing countries[33]. A further interesting avenue that could be explored is to exploit variations in the real wage that arise from changes in agricultural prices since these have household-specific effects to the extent that the crop mix differs across households (see Alessie *et al*, 1992).

9.2. Target Incomes and Subsistence

Consider interpretation of the main result, a negative wage elasticity for boys. We identify a wage elasticity not significantly different from –1 when the wage is instrumented and otherwise, this elasticity ranges between –0.3 and –0.6. A negative wage elasticity less than unity is consistent with near-subsistence for the following reasons. (1) Subsistence may be maintained by reducing the quality of the goods basket. (2) There may be a biological range to subsistence (For a discussion of this idea, see Srinivasan (1993) and Dasgupta (1993, Chapter 15)). (3) Since wage-working boys average 45 hours in the reference week, they may not have the physical capacity to maintain earnings in the face of decreases in the wage. (4) In the case of wage increases, one may argue that consumption is sticky and that this is why the downward adjustment is not made to its full extent.

Let us pursue the idea of sticky consumption for a moment. Suppose that notions of subsistence at the household level are conditioned by past experience. For example, a parent may be addicted to tobacco, or a sibling may be enrolled in school and expected to continue, and these expenditure "needs" may be worked into the notion of subsistence. Then it is possible to interpret the finding of a negative wage elasticity of labour supply in terms of "selfish" parents (the tobacco case) or "discrimatory" parents (the sibling case) rather than in terms of extreme poverty[34]. In other words, the child may have to increase work hours in response to a decline in his wage because he is financing his father's tobacco or his sibling's education. Note that if parents were just selfish, rather than committed to having the boy finance a

[33] See www.worldbank.org/lsms for information on household surveys of this sort for dozens of countries.

[34] The hypothesis of selfish (or discriminatory) parents is investigated in Bhalotra (2000b).

particular item of spending, then the wage elasticity would be zero (as it is for girls), not negative. Also note that the main result in this paper is that boys appear to be constrained to earn and this stands although, as suggested in this Section, the constraint may not be as simple as a fixed subsistence constraint.

9.3. Substitution & Income Effects: The Slutsky Equation

This Section considers why the income effects on child labour are so small and, related, how we might reconcile violation of the Slutsky condition (for boys) with theory. The income elasticities we estimate are –0.17 for boys and –0.34 for girls. While it is not terribly unusual to find negative wage elasticities and small income effects in labour supply equations estimated for *adults,* whether in India or the USA (see Heckman (1993) and Section 2.2 above), and many authors do not explicitly evaluate the Slutsky equation, **a small income effect observed for *child* labour** is rather more surprising. Yet, this result seems quite pervasive in the literature (see Section 2.1). It seems that only a very small share of an increase in non-labour income is used to purchase child education or child leisure. This invites investigation of parental altruism, and the mechanisms for work allocation within the household. The implicit target income towards which boys appear to work may not be set by a shortfall in subsistence consumption. Instead, the target could, for example, be set to cover the boys' own costs, or the costs of sending a sibling to school. A careful analysis of these issues is beyond the scope of this paper but the following results, all drawn from the rural Pakistan data, offer clues that may motivate further research[35]. (1) The size of the income effect increases substantially (to –0.5) if we explain not the individual child's hours but average hours of all children in the household (Section 8). (2) Conditioning on parents' hours of work results in a three-fold increase in the income effect on child hours (Bhalotra, 2000a). This is consistent with some of the increase in non-labour income being consumed as parental leisure. (3) Engel curve estimates for the share of adult goods such as tobacco reveal that adult-good consumption is no lower in households where children work and, strikingly, that more tobacco is consumed in households where girls work (holding constant total income) (Bhalotra, 2000b). This is consistent with "selfishness" on the part of parents.

The Slutsky condition for theoretical consistency is violated for boys though not for girls. At the sample means, the pure substitution effect is estimated to be –0.16 for boys and 0.092 for girls. First, consider the fact that **the substitution effect for girls is bigger than for boys**. This is consistent with the more universal finding that girls are more responsive to changes in the real wage because their alternative to market work is home production, in which their time is relatively valuable[36]. Using data from both Pakistan and Ghana and isolating child work on the *household farm*, Bhalotra and Heady (2000) also report evidence of larger substitution effects for girls than for boys. Second, consider how the violation of the **Slutsky condition** for boys may be reconciled with theory. (1) It is consistent with rejection of income pooling among household members. In particular, the income effect of a change in the child wage may not be the same as the direct income effect (the coefficient on household income) arising from, say, a change in the father's wage or in the prices of farm produce. (2) Related to income pooling but distinct, Slutsky consistency need not hold if child labour supply is not separable from the labour supplies of other household members. For instance, an increase in the work hours of the mother may, in addition to having an income effect on child work, also have a substitution effect (this is investigated in Bhalotra, 2000a). (3) Another possible explanation of the violation for boys arises if different households have different target incomes or subsistence levels since the Slutsky equation is only expected to hold for homogeneous utility functions. Further research in these directions is merited.

10. Conclusions

This paper makes precise the common notion that children work because they come from subsistence-poor households and argues that this hypothesis can be investigated by estimating the wage elasticity of labour supply. An advantage of the method is that it does not require selection of a poverty line: appropriate use of economic theory allows us to infer from the behaviour of people whether or not they are living close to subsistence.

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[35] For example, an extension of the model in Blundell, Chiappori, Magnac and Meghir (1998) to incorporate children might provide useful insights.

[36] The alternative to market work for boys seems to be school attendance, in which they face higher marginal returns than girls. However, our estimates condition on participation in market work and we have seen that less than 1% of children combine market work and school (Table 1).

The ILO, the World Bank, UNICEF, Save the Children and several governments in developing countries are currently engaged in formulating large programs, the objective of which is to reduce child labour. It is important for the design of these programs to find out whether child labour is primarily compelled by poverty or whether other forces- such as school quality or avarice on the part of parents- play a central role. The programs can accordingly decide whether to allocate resources towards income-generating programs, school infrastructure or legislation. To the extent that household poverty ("family background") is an important cause, child labour signifies the absence of equality of opportunity and is a mechanism for the intergenerational transmission of poverty.

Labour supply equations are estimated in this paper for hours in wage work of boys and girls in rural Pakistan. The results are consistent with the view that boys work because their income contribution is necessary to household consumption needs: their households seem unable to afford the opportunity cost of school. This result calls for a reconsideration of policies that have recently been proposed as ways of eliminating child labour. To the extent that *trade sanctions* displace children into industries that pay lower wage rates, our estimates indicate that they will increase average hours of child work, thereby contradicting their stated purpose. Similarly, a *ban* on child work will, in a world of altruistic parents, have deleterious effects in the short run. However, if parents take the decision on child work and their notion of a target income includes tobacco and alcohol (see Section 9), then a ban may be appropriate[37]. Policies directed at raising the marginal *return to schooling* are unlikely to be very effective for households living close to subsistence because the marginal utility of consumption rises rapidly at this threshold. Therefore interventions aimed at reducing boys' work need to address household poverty as a priority. Our estimates for girls suggest that they work even when it is not necessary. We also find larger substitution effects for girls than for boys. Thus improving returns to school for girls, which are considerably lower than for boys (refer Section 4.2), has the potential to both reduce child labour and raise school attendance amongst girls. Our analysis also

[37] On the subject of a ban, Basu and Van (1998) argue that it may be beneficial in the long run if it serves to coordinate a reduction in fertility, or in the short run if the removal of children from the labour market results in a bidding up of the adult wage rate. The latter scenario envisages a well-functioning labour market and households in which adult *labour* income is a sufficiently large component of total household income (which includes asset income, income

makes clear that exploration of the gender differences in education and child labour must be an inherent part of an attempt to understand the causes of child labour. Closing the gender gap will make a significant impact on average child participation rates. The estimates in this paper are subject to a battery of robustness checks. Discussion of the results points to directions for future research pertaining to parental altruism and the intra-household allocation of leisure and educational resources.

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from self employment). Additionally, note that schooling in Pakistan is not compulsory and the only prohibition on child work applies to under-15s in hazardous industrial employment.

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Table 1

A Profile of Child Activities

	Boys	**Girls**
Total participation rates		
Wage work	**6.2%**	**11.9%**
Household Farm work	22.1%	28.1%
Household Enterprise work	2.3%	1.6%
School	72.8%	30.5%
None of the above activities	14.0%	42.4%
Domestic work	n.a.	99.4%
Participation in one activity		
Wage work only	3.2%	6.8%
Farm work only	8.6%	21.1%
Enterprise work only	0.64%	1.2%
School only	61.3%	27.6%
Combinations of types of work		
Farm & enterprise work	0.91%	0.09%
Household farm & wage work	2.1%	4.1%
Household enterprise & wage work	0.25%	0.27%
Combination of work & school		
Farm work & school	10.5%	2.7%
Enterprise work & school	0.50%	0%
Wage work & school	0.74%	0.73%
Number of children	1209	1096

Notes: Rural Pakistan, 10-14 year-olds. n.a.=not available.

Table 2

Child Activities By Quartile of Per Capita Food Expenditure

Participation Rates and (Hours)

	Boys	**Girls**
Wage Work		
Full sample	6.2 (31)	11.9 (45)
Quartile 1	8.2 (44.6)	18.8 (31.7)
Quartile 2	6.9 (51.8)	11.5 (33.6)
Quartile 3	4.7 (40.7)	8.0 (35.5)
Quartile 4	5.0 (36.4)	9.4 (24.7)
Work on the Household Farm		
Full sample	22.1 (23.3)	28.1 (13.3)
Quartile 1	24.3 (20.6)	25.4 (11.5)
Quartile 2	23.0 (23.2)	26.8 (15.3)
Quartile 3	21.1 (25.2)	29.7 (13.9)
Quartile 4	19.8 (25.1)	30.8 (12.6)
School Attendance		
Full sample	72.8	30.5
Quartile 1	65.4	26.3
Quartile 2	69.3	26.8
Quartile 3	77.0	33.5
Quartile 4	79.1	36.0

Notes: All figures are percentages except figures in parentheses which are **weekly hours of work** in the reference week, conditional on participation. The mean of p.c. food expenditure by quartile in Rupees per month is 98.7, 163.1, 223.9 and 429.7. The average foodshare in the sample is 0.50, the average p.c. food expenditure is Rs. 228.8 and average p.c.total expenditure is Rs. 493.8.

Table 3

Main Results and Alternative Specifications

Specification	*Wage Elasticity*		*Income Elasticity*	
	Boys	**Girls**	**Boys**	**Girls**
Preferred specification	**-0.33****	**-0.05**	**-0.17***	**-0.34****
Include occupation dummies	-0.25**	-0.06	-0.081 (-0.18**)[2]	-0.54**
DV: hours of wage work + hours on household farm/ent.	-0.41**	0.04 (-.16*)[1]	-0.020 (-0.22*)[2]	-0.32**
DV: gender-specific aggregate across siblings	-0.14 (*)[2] (-0.24**)[1]	-0.03	-0.16* (same)	-0.37**
DV: aggregation over all siblings	-0.12 (-0.12**)[2]		-0.51** (same)	
IV for w,Y: with controls	-1.4**	-0.19	-0.0032	0.27
IV for w,Y: no controls	-0.45**	-0.14	-0.19**	-0.50*
Sample of adult men & women	-0.29**	-0.20**	-0.0044	-0.16**

Notes: Dependent variable=Hours in wage work for 10-14 year olds. See Sections 7-8 of text. DV is dependent variable, IV is instrumental variables estimates, w is the child wage, Y is household income. In row 8, the boys' column has estimates for men and the girls' column for women (18-59 yrs). * denotes significance at the 10% level and **at the 5% level. The table also shows results obtained when hours are measured for the reference week (indicated [1]) and when all control variables are dropped (indicated [2]).

Table 4

Investigating Robustness to Definitions and Functional Forms

Specification	*Wage Elasticity*		*Income Elasticity*	
	Boys	**Girls**	**Boys**	**Girls**
Preferred specification	**-0.33****	**-0.05**	**-0.17***	**-0.34****
Drop controls	-0.36	-0.07	-0.23**	-0.39**
Sample of 10-17 year olds	-0.36**	-0.075 (*)[1]	-0.12**	-0.29**
DV = hours in last week	-0.37**	-0.09*	-0.07*	-0.19*
Y = consumption	-0.25**	-0.08	-0.15	0.28
Y= asset & parent income	-0.38**	-0.11 (**)[1]	-0.004, 0.24	-0.05, 0.40
Logarithm of hours	-0.58**	-0.05	-0.15 (-0.16*)[2]	-0.48**

Notes: See Notes to Table 3. [1]Dependent variable=hours in the reference week, [2]Control variables are dropped.

Table 5

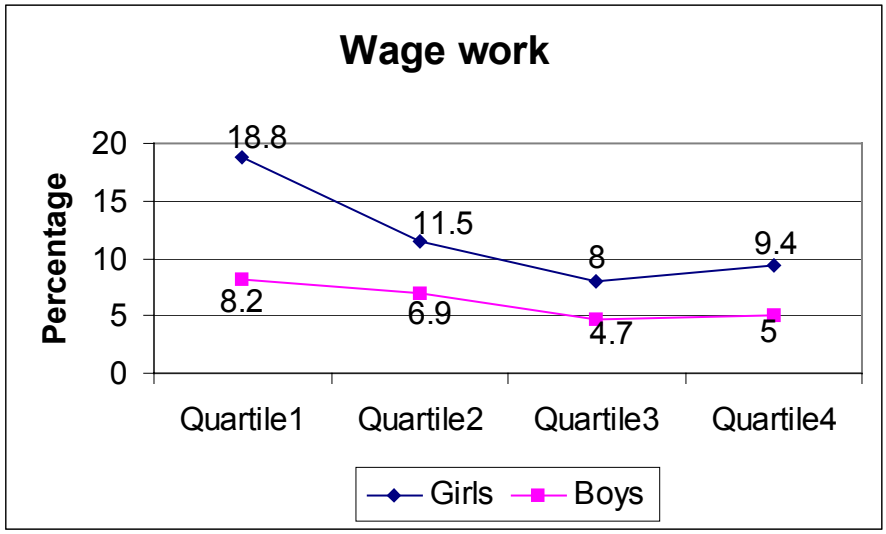
Gender Comparison of Living Standards of Households With Wage-Working Children

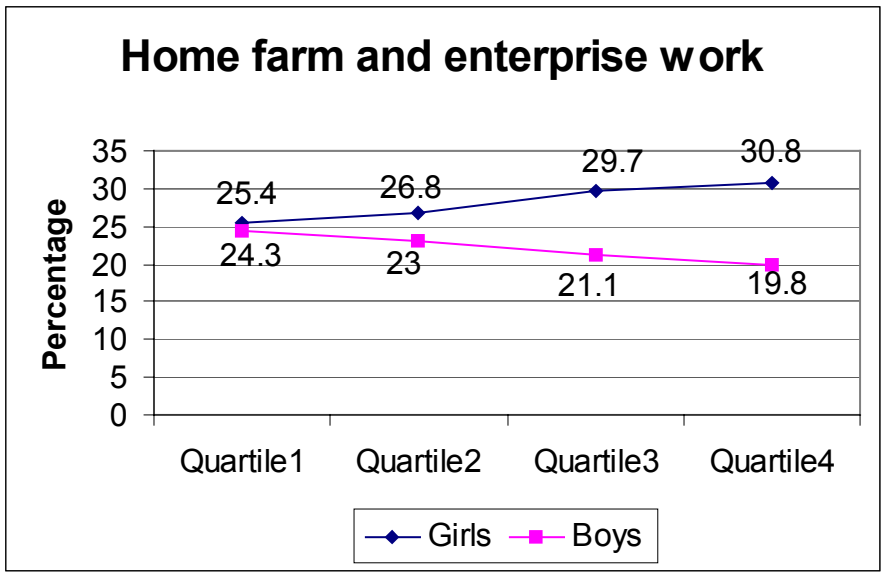
	Boys	Girls
Lifecycle-consistent income	162	279
Per capita expenditure	363	366
Wealth excluding value of land	31529	33541
Percent of households that own land	17%	26%
Household size	9.1	8.3

Notes: Sample of households with at least one 10-14 year old engaged in wage work. Figures in rows 1-3 are in Rupees. The measures of income in rows 1 and 2 include the child's contribution to income. The percentage contribution of boys is about 30% and that of girls about 15% and this reinforces the result that *households with wage-employed boys are poorer on average than households with wage-working girls.*

Figure 1

Child Participation Rates by Quartiles of Food Expenditure Per Capita





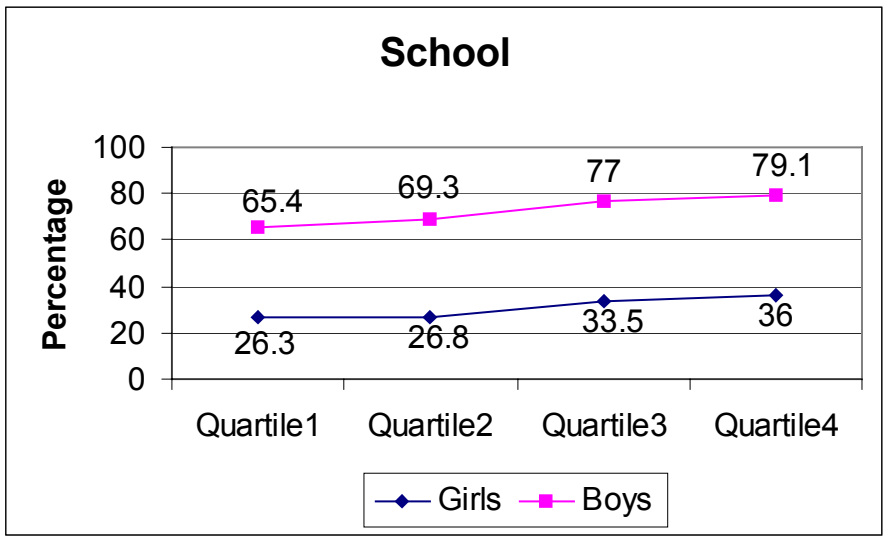
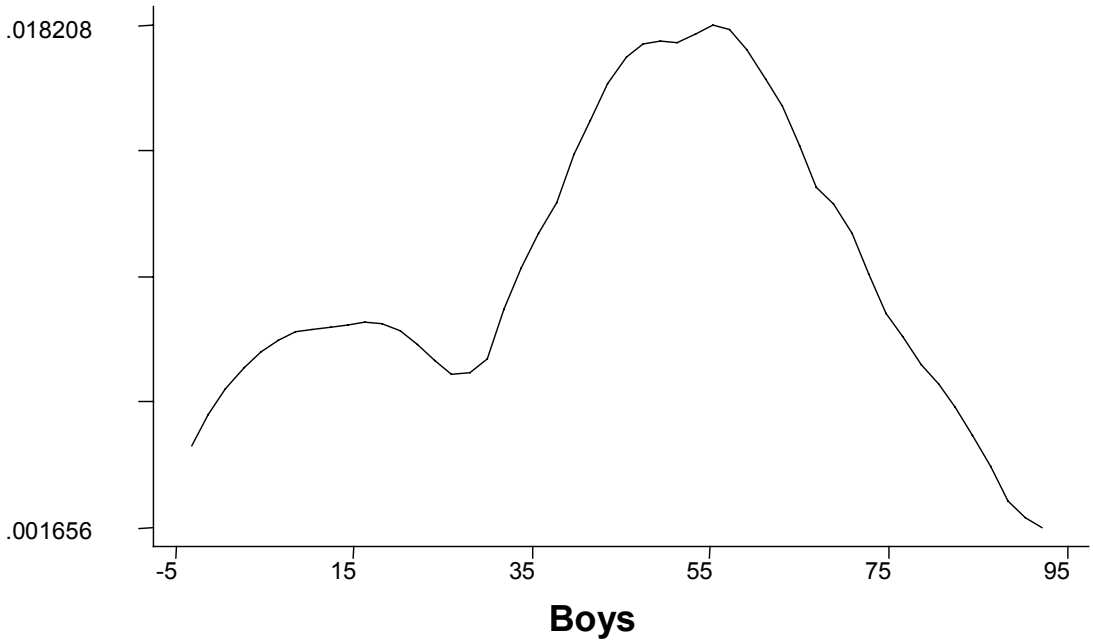
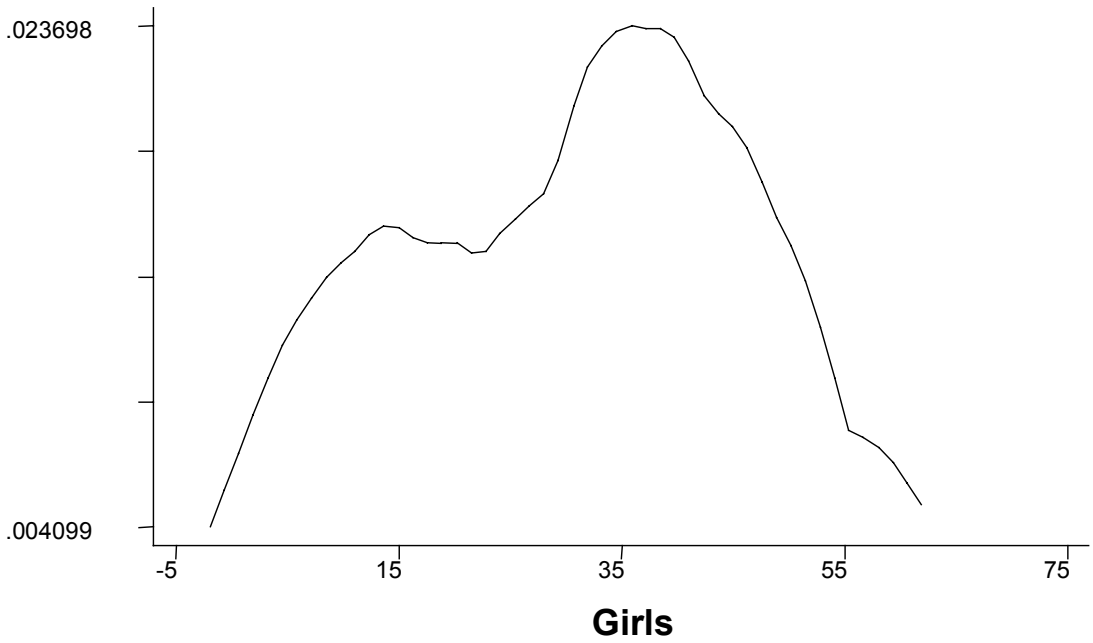


Figure 2

Hours of Wage Work



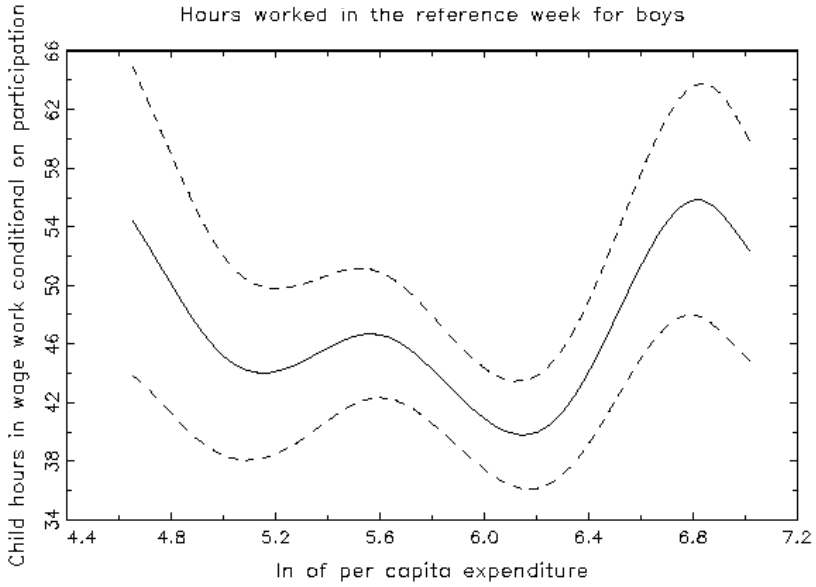


Notes: 'Children' are 10-14 years old. The figures show a kernel density fitted to data on hours worked for wages in the reference week.

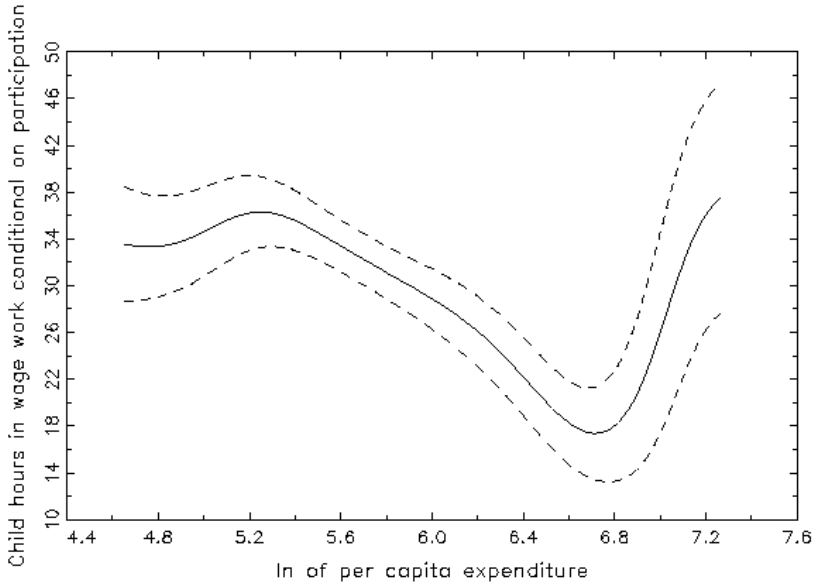
Figure 3

The Relation of Hours of Work and Expenditure: Nonparametric Estimates

Boys



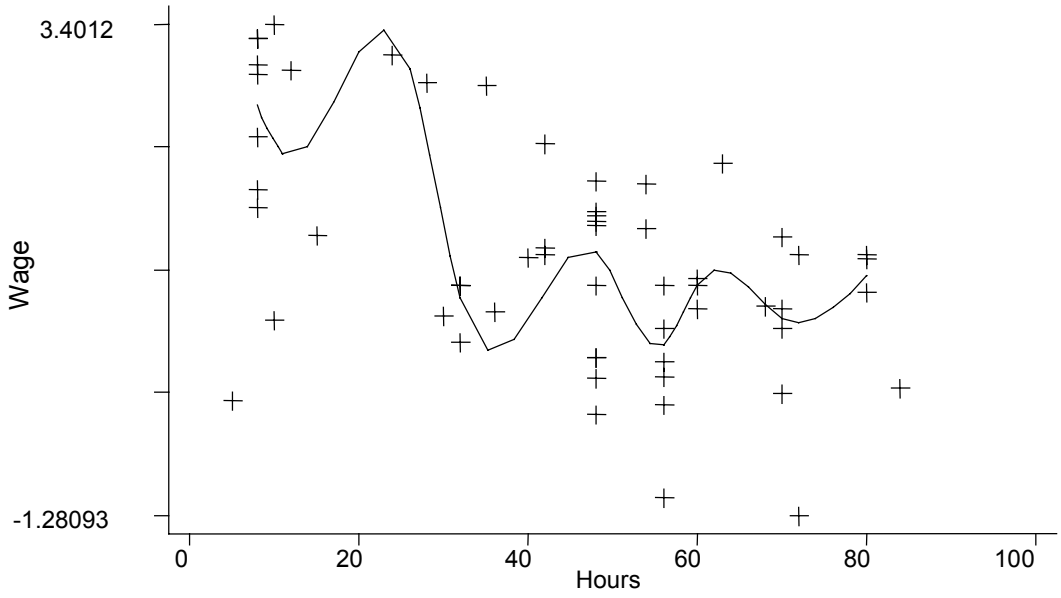
Girls



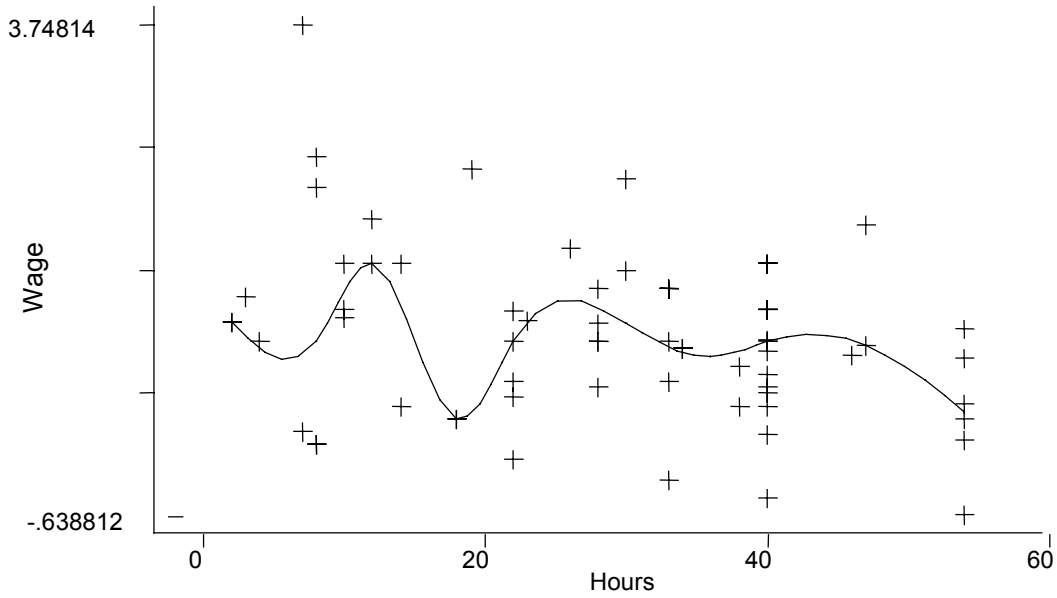
Notes: Child hours in wage work conditional on participation as a function of the logarithm of per capita expenditure of the household. The nonparametric estimation uses a Gaussian Kernel.

Figure 4

Hour-Wage Scatter



Boys



Girls

Notes: The fitted curve is a cubic spline. The data are hours of wage work in the reference week and a child- specific wage rate