Childhood Investments in Human Capital: Parental Resources and Preferences

Sonia Bhalotra*

Abstract

This paper investigates the way in which parental human capital investment in young co-resident children varies with their own consumption and leisure. It is motivated by rejection of parental altruism in recent research, the unexpectedly small effects of parental income on child outcomes found in a number of studies, and the claim in several historical and anthropological studies of child labour that parents are selfish. The results suggest that, in the preference function of parents, child schooling is a normal good and that child labour is a bad, consistent with altruism. I also test the income pooling prediction of the unitary model and find that I cannot reject it; there is no evidence that the consumption of children is increasing in their labour supply.

Keywords: altruism, m-demands, intra-household allocation, human capital, child labour, education.

JEL codes: C2 I2 O1 R2

*Department of Economics, University of Bristol, 8 Woodland Road, Bristol BS8 1TN, UK. Tel +44 117 928 8418. Email: s.bhalotra@bristol.ac.uk. Also, Research Fellow IZA (Bonn), CHILD (Turino) and Wolfson College (Cambridge), Research Associate Centre for Study of African Economies (Oxford) and Queen Elizabeth House (Oxford), Member CMPO and International Poverty Centre (Bristol).

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Sonia Bhalotra, University of Bristol (UK)*

1 Introduction

In his survey of theories of intrahousehold allocation, Behrman (1997: p.132) observes that "parents who are insufficiently wealthy or insufficiently altruistic fail to provide their children with the socially efficient wealth-maximising level of human resources." While many previous studies have argued that sub-optimal levels of human capital investment can be explained by credit constraints (e.g. Loury 1981, Parish and Willis 1993, Ranjan 2001, Baland and Robinson 2000, Edmonds 2003), much less attention has been directed, in this context, at the role of parental preferences (though see Banerjee 2003, for a theoretical discussion).[1] Models of educational investment and child labour typically assume parent altruism (e.g. Becker and Tomes 1986, Dessy and Pallage 2001, Basu and Van 1998, Baland and Robinson 2000). But when parents decide how much to spend on the human capital of their children and the rewards accrue to the child, and over a long horizon, there is an evident agency issue (e.g. Baland and Robinson 2000).

Childhood is the time when critical investments in human capital are made that have far-reaching and often irreversible effects on future life-chances. In developing countries, where public provision is limited, parental preferences and resources play an especially important role. Evidence of limited parental altruism would lend weight to legislative interventions such as bans on child labour and compulsory schooling laws, and it would challenge the efficacy of unconditional cash transfers. Cash transfer programmes are increasingly popular amongst interventions

* I am grateful to Martin Browning, Christian Dustmann, Sylvain Dessy, Andrew Foster, Chris Heady, Saqib Jaffrey, Steve Nickell, Ian Preston, Ken Swinnerton and Alessandro Tarozzi for helpful comments. The paper has benefited from presentation at the NEUDC Meetings in Boston (Sept 2001), the AEA/AESM Meetings in Atlanta (Jan 2002) and seminars at the Research Department of the World Bank (Mar 2002), George Washington University (Mar 2002), the LSE (STICERD: May 2002), Bristol (Nov 2001), Cambridge (Sep 2001), Sussex/IDS (Nov 2001), the Indian Statistical Institute in Delhi (Dec 2001), and the Centre for Applied Microeconomics in Copenhagen (June 2004).

[1] Rogers and Swinnerton (2003) cite the historical research of Parsons and Goldin (1989) and an earlier version of this paper (Bhalotra 2001) as being the only available empirical studies that attempt to examine parental altruism in the context of child labour and schooling.

conducted by governments and international organizations in developing countries, many of which carry the objective of increasing school attendance and reducing child labour (e.g., the Food for Education Program in Bangladesh, Progresa in Mexico, Bolsa Escola in Brazil). The fact that, in many cases, the cash transfer is conditional upon attendance at school or health clinics suggests that concern about possible "leakages" is recognized on the field (Becker 1999).

This paper tests the first-order condition common to most theoretical models in the literature, in which altruism is assumed. According to this, moving a child into work is associated with a decrease in the consumption (or leisure) of parents. The idea is that parents will equate the marginal utility of their consumption to the marginal utility of child leisure (which is higher if children work). If this condition holds then we can reject the hypothesis that parents are selfish or exploitative. It is also interesting to quantify the trade-offs involved. The paper estimates *m*-demands, which describe the indifference curve between adult consumption and child labour. In this way I directly estimate the ratio of income effects on child labour and adult consumption. Following a closely related literature, expenditure on adult consumption is instrumented with a cubic in income, and I follow Moreira (2002) to obtain tests that yield the correct rejection probabilities for the specifications in which the instruments are weak.

The data analysed are a household survey for rural Pakistan, a poor society in which human capital investment in children is low and poverty and market imperfections impact most households. I find no support for the view that parental exploitation drives child labour; both child leisure and schooling appear as normal goods in the parental utility function. Specifically, a 10% increase in adult clothing expenditure is associated with about a 6 percent point increase in the proportion of children in the household that attend school, or a 3 percent point decrease in the proportion of children in work. This result is robust to conditioning upon adult labour. Pairs of Marshallian demands provide point estimates that are larger but not significantly different from the *m*-demand estimates. If I use tobacco expenditure rather than expenditure on adult clothing as the reference good, then I find a seeming anomaly: child labour is invariant to increases in tobacco expenditure. At the same time, increases in tobacco expenditure are associated with increases in schooling. I argue that the results are reconciled if selection into smoking (non-zero tobacco expenditure) is correlated with unobservables in the equation for child labour (see

section 4.2). Further analysis shows that children are less well-off in households that have at least one smoker.

Previous studies of intergenerational altruism effectively test income pooling (see Altonji et al 1992, 1997, Hayashi 1995).[2] The condition I test, of positive transfers, is weaker. However, I extend the analysis to further investigate income pooling by regressing child clothing expenditure on child labour, holding constant total expenditure and adult labour. I cannot reject income pooling: expenditure on children is not increasing in their labour (also see Moehling 2004, Bhalotra and Attfield 1998).

This research faces two potential challenges. First, that it establishes a result that is trivial or evident and, second, that it is unable to distinguish between investments in children that are motivated by reciprocity rather than by altruism. I now defend it against these concerns, in turn.

In a largely unnoticed challenge to the prevalent assumption in the human capital literature, numerous historical and anthropological studies of child labour have cast parents as selfish, sending their children to work to further their own consumption, or to pay off their debts.[3] Using US and Japanese data, direct tests of intergenerational altruism have tended to reject it (see Cox and Rank 1992, Altonji *et al* 1992, 1997, Hayashi 1995). In their analysis of child benefit in the UK, Blow, Walker and Zhu (2004) find that it is spent disproportionately on alcohol. Micro-econometric research has found some surprisingly small effects of parental income on child labour (see Rogers and Swinnerton (2004), Bhalotra and Tzannatos (2003), Brown et al (2003), for example) and schooling (e.g. Behrman and Knowles 1999). Small effects of parental income on child outcomes have been also been noted in other contexts (e.g., Shea 2000, Mayer 1997, Currie 1995, Haveman and Wolfe 1995: p.1856). Overall, it is not evident that improvements in family income are shared with children so that their leisure or schooling increases. This paper delivers estimates of

[2] It is straightforward to show that the income transfer derivative restriction investigated in, for example, Altonji et al 1997, holds only if income pooling holds. Although it is clear in the wider literature that altruism does not imply income pooling and that income pooling can hold in the absence of altruism, available tests of intergenerational altruism are effectively tests of income pooling.

[3] Among economic historians, see Parsons and Goldin (1989) and Nardinelli (1990, p. 94), with reference to nineteenth century USA and England respectively. See Khan (2001) for anthropological work on contemporary Sialkot in Pakistan; see Burra (1995), Bhatty (1998)

how income is allocated within the household between child leisure (or schooling) and adult consumption. In the altruistic model, this corresponds to the relative weight that parents place on the child good.

This paper neglects the issue of altruism versus investment that has been central in research on transfers between parents and adult children who live in separate homes, mostly in the US (e.g. Cox and Rank 1992, Laitner 1997). Consistent with its focus on child labour in poor liquidity-constrained households, it instead considers altruism versus exploitation in the context of human capital investment in children who are co-resident minors. The eventual question of interest here is whether low levels of human capital in developing countries can be attributed to parents failing to attach any weight to schooling, for whatever reason. Whether or not children reciprocate when they are older is not of direct interest here since, at the time when parents are making investment decisions, they cannot contract their children to make these return transfers (further discussion is in section 2.2).

Section 2 describes the analytical framework and section 3 describes the data and estimation issues. The main results are presented in section 4. Section 5 investigates robustness to alternative specifications, and section 6 concludes.

2 An Analytical Framework

The prediction of the altruistic model that is tested is set out in section 2.1, where it is shown to flow from a general class of models in the literature. Section 2.2 argues that the competing hypothesis that parental human capital investments in children are motivated by anticipation of reciprocal transfers in old age is not compelling and, more important, not relevant to the objectives of this paper. *M*-demands are introduced in section 2.3 as a useful way of estimating the relationship of interest, and section 2.4 shows that this is equivalent to estimating the marginal effect of income on the child outcome, relative to the marginal effect of income on adult consumption. Previous research has tended to interpret income effects on schooling or child labour as indicating credit constraints, (implicitly) maintaining the assumption of parental altruism. It is argued that one could equally maintain the assumption that credit constraints bind and interpret absent income effects in terms of (absent) altruism.

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and Gupta (2000) for field-based research that is consistent with parental selfishness in India; and Fyfe (1989, p.76).

2.1 The hypothesis

Suppose that the (period-1) utility function of the parent is $A^a H^b L^g C^q$, where A refers to (above-subsistence) adult consumption, H refers to child human capital (schooling), L is child labour, and C refers to all other consumption, assumed to be shared. To the extent that child labour reduces schooling, this is reflected in H. The appearance of L in the utility function allows for a separate role for child leisure, or for parents to derive disutility from seeing their children work (as in Bommier and Dubois 2003). It follows directly from the standard optimization programme that $\partial H/\partial A=(b/a)(p_A/p_H)>0$, where p_A, p_H are prices of A and H. Similarly, $\partial L/\partial A<0$.[4] The estimates will, of course, confirm whether or not child labour is a "bad", and to what extent child labour and schooling are substitutes. Under the null of egoistic parents, when neither of H and L appear in the parental utility function, $\partial H/\partial A=0$ and, since child labour augments income, $\partial L/\partial A \geq 0$.[5] This is the condition that is tested.

Basu and Van (1998) set out a simple single-period model in which a critical assumption is that parents are altruistic and only send their children to work if this is essential to the survival needs of the household. Clearly, this implies *no* above-subsistence consumption in households with child labour. The condition tested in this paper flows from a more general description of parental altruism, which involves parents attaching a positive weight to child schooling and a negative weight to child labour. Baland and Robinson develop a 2-period model in which child labour in period 1 reduces schooling attainment and, thereby, earnings capacity in period 2. In period 1, the parent decides the allocation of child time. In period 2, the child decides whether to make a transfer to the parent and the parent decides how much to consume and how much to leave the child in bequests.[6] The first order conditions of this model shows that the level of human capital investment in period 1 will co-vary with the

[4] For this simple illustration, I have described parental preferences as depending directly on the level of human capital of the child in period-1. This is sometimes referred to as the warm-glow formulation (e.g. Banerjee 2003). The testable predictions that we are concerned with in this paper are unchanged if, instead, the caring representation of preferences (e.g. Bourguignon *et al* 1994) is used, in which parent utility depends upon child utility, as long as child utility is increasing in H and decreasing in L.

[5] The first version of this paper sets out a more general model that includes the consumption and labour supplies of parent and child (Bhalotra 2001). Although here I discuss how child labour varies with adult consumption, below I also consider how it varies with adult labour supply.

[6] The labour supply of parents is assumed exogenous in these models. This assumption is relaxed in the empirical analysis in this paper.

level of parental consumption in period 1. This is the condition tested in this paper. If, instead, parents were selfish and neither cared about child utility nor derived a "warm glow" from the level of human capital of their children, then additional income would be spent on parental consumption (or leisure) without necessarily incrementing the level of human capital of their children (the case of a horizontal income expansion path). Similarly, if parental utility depends upon child utility, or if child labour directly generates disutility for the parent, the FOCs will imply a negative relation of child labour and parental consumption. Any increment in income will be used to simultaneously buy more parental consumption and reduce child labour (in line with the MRS condition). This condition is also tested.

Some existing research has investigated whether, *when* children work, incomes are pooled (Bhalotra and Attfield 1998, Moehling 2004). This research is motivated by the idea that income-shares of family members are associated with bargaining power and therefore with resource claims. But the prior question is: *Why* do children work? To understand this, it is relevant to consider whether parents cut back their own above-subsistence consumption or leisure in order to avoid the child working. No previous research has attempted to investigate this.

2.2 Altruism *vs* exchange motives

The previous section describes a testable prediction of the altruistic model. Finding that the data satisfy that prediction is, as always, potentially consistent with *other* hypotheses. The main competing hypothesis here is that of exchange: parents may send their children to school rather than to work not because they are altruistic but because they expect that a higher level of investment in child human capital in period-1 will bring them higher return transfers in period-2 (e.g. Nugent 1985, Cox 1987, Lillard and Willis 1997).

The exchange motive is undermined by the fact that it is difficult for parents to enforce repayment from children, especially over a long horizon (e.g. Baland and Robinson 2000, Fitzsimmons 2003).[7] Moreover, the evidence on the exchange motive is not compelling. Although positive evidence is reported in Lillard and Willis (1997)

[7] Fitzsimons emphasizes that even where there are *ad hoc* transfers from child to parent in period 2, what is important is that, when parents are making human capital decisions in period 1, they know that reciprocity is not enforceable. Although Lopez-Calva and Miyamoto (2004)

and Lucas and Stark (1995), Kochar (2000), Fitzsimons (2003) and Pal (2004) find little support for the hypothesis that the probability or amount of transfers received by elderly parents is increasing in the level of education of their children. The distinction between altruism and exchange may, further, be seen as *inherently* impossible to make. Thus, even when the child's utility is an argument in the parental utility function, parents are maximizing their own utility and, by that criterion, may be regarded as selfish, not altruistic (Becker 1981, p. 2). Becker clarifies that the definition of altruism that he proposes is one that is relevant to behaviour rather than to the more philosophical question of what "really" motivates people. This is also the case in this paper. In the analysis, "altruism" denotes a positive weight attached to sending a child to school (or a negative weight attached to putting a child in work) in the current period for whatever reason. The deeper motivation may be argued to be largely irrelevant if the motivating question relates to the extent to which additional income in the hands of parents (which may be provided by a cash transfer) translates into child human capital.[8,9]

2.3 M-Demands

The first order conditions of the altruistic model discussed in section 2.1 can be solved to write child human capital, H, and child labour, L, as functions of a category of adult consumption, A_j, and all prices ($\boldsymbol{p}$):

(1a) $H = f_H(\boldsymbol{p}, A_j)$

(1b) $L = f_L(\boldsymbol{p}, A_j)$

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conjecture that social norms may be strong enough for children to compensate parents in their old age, Becker and Murphy (1988) conjecture the opposite.

[8] The issue of identifying which of altruism and exchange motives operate at the margin relates to a somewhat generic problem of inferring preferences from expenditure data. It arises, for example, in studies of intra-household allocation that are motivated to test for "discrimination" against girls (e.g. Deaton 1989, Ahmad and Morduch 1993). These studies do not permit identification of whether observed effects of gender reflect preference weights, or whether they reflect differential market incentives such as arise if boys earn more on the labour market than girls with the same level of human capital (see Behrman 1997: section 3.3.2).

[9] A similar argument has been made in previous policy-motivated empirical research. For example, in their analysis of whether people with schooling make more efficient use of information on contraceptives, Rosenzweig and Schultz (1989: p.458) acknowledge the possibility that schooling levels may merely proxy pre-existing skills ("ability"), but argue that this conceptual distinction is irrelevant to the pragmatic issue of targeting of public information programs on contraception.

These are *m*-demands which, with H (or L) and A_j set at their optimal values, describe the indifference curve between them. In an *M*-demand, a reference good (A_j) replaces total expenditure (see Browning 1998).[10] *M*-demands have been used, implicitly or explicitly, in Heckman (1974b), Altonji (1986), Meghir and Weber (1996) and Attanasio and MaCurdy (1997). Here, *m*-demands offer a natural estimating framework since they directly deliver estimates of the parameter of interest, $\partial H/\partial A_j$ in (1a) and $\partial L/\partial A_j$ in (1b). *M*-demands will have an advantage over standard demand functions if the reference good is measured with less error than total expenditure, and they are especially useful when data on total expenditure are unavailable (see Browning 1998). As we do have total expenditure, for comparison, these parameters are also derived from pairs of Marshallian demands (section 2.4 below). Estimation of *m*-demands or else *pairs* of Marshallian demands is useful compared with estimation of single-good Marshallian demands because comparison of the ways in which child and adult expenditures vary nets out considerations of income uncertainty and lumpiness in expenditure (e.g. Kooreman 2000: footnote 5). To the extent that expenditures on sub-aggregates of consumption are measured with less error than total expenditure, *m*-demands may produce more robust estimates than Marshallian demands.[11]

2.4 Ratio of marginal income effects

This sub-section shows that the paramaeter of interest, $\partial H/\partial A_j$ is simply the ratio of the marginal income effects on H and on A_j (and similarly for $\partial L/\partial A_j$). It follows Browning (1998), except that Browning looks at different categories of household

[10] The "*m*" arises because *m*-demands can be derived from the marginal rate of substitution condition. It has no relation to the fact that total expenditure is denoted *m* below. Closed form *m*-demands are obtainable from the first order conditions only for a particular class of utility functions (like the LES). However, the fact that we do not have to simultaneously solve for the budget constraint makes this approach more widely applicable than it is for Marshallian demands (Browning 1998).

[11] Errors creep into the calculation of total expenditure through imputation of the value of home-produced consumption, consumption of wages in kind, gifts, remittances, and any public transfers. In addition, there are fundamental difficulties in incorporating into estimates of total expenditure, the value of durables and leisure. Recognising the importance of measurement error in expenditure (or income) is potentially important to interpretation of previous studies of child welfare. Given that conventional measurement error in a variable biases its coefficient towards zero, the finding that income effects on child outcomes are sometimes absent or surprisingly small (see section 1) may be spurious.

expenditure rather than at expenditure on adults and children. The pair of Marshallian demands for human capital and adult consumption are:

(2) $H = H(\mathbf{p}, m)$

(3) $A_j = A_j(\mathbf{p}, m)$

where m is total household expenditure and $\mathbf{p}$ is the price vector. As long as (3) is monotonic, guaranteed by A_j being normal through the range of incomes, it can be inverted to get $m = m(\mathbf{p}, A_j)$. Substituting this in (2) gives:

(4) $H = H(\mathbf{p}, m(\mathbf{p}, A_j)) = f(\mathbf{p}, A_j)$

which is nothing but (1), the m-demand for human capital. This formulation clarifies that income contains no additional information once the level of the reference good is held constant. Studying (4) also reveals that the coefficient of interest is simply the

(5) $$\frac{\partial \mathrm{H}}{\partial A_j} = \left(\frac{\partial H}{\partial m}\right)\left(\frac{\partial m}{\partial A_j}\right) = \left(\frac{\partial H / \partial m}{\partial A_j / \partial m}\right)$$

ratio of the income effects on the two goods, H and A_j:

If A_j is normal, the denominator of the final term in (5) is positive. Thus investigating the prediction of the altruistic model that $\partial H/\partial A_j > 0$ boils down to finding out if $\partial H/\partial m > 0$, or if child human capital is normal (and similarly when considering L rather than H, except for a sign reversal).[12]

Popular discussion of the size of the effect of parental income on child outcomes tends to neglect the fact that it contains information about altruism. For example, using the South African pension reform as a source of exogenous variation in income, Edmonds (2004) finds that the increase in income in eligible households resulted in a decline in child labour and an increase in school enrolment in these households. He interprets this as indicating that these households were credit constrained. But effects of family wealth and parental preferences on the level of

[12] The test has power against most relevant alternatives except for the one where there is no income effect on the child good as would be the case, for example, if preferences were quasi-linear (e.g. $U=A_j+v(H)$). I am grateful to Andrew Foster for pointing this out.

educational investment can arise even with perfect capital markets if there is symbolic consumption of that investment – that is, if parents get positive utility in the current period from their child attending school (see Banerjee 2003). Another interpretation of the result, which is not discussed, is that grandparents are, in that setting, altruistic. This is especially relevant if we consider the results of a similar analysis of the South African pension by Duflo (2003). She finds that, when the pension recipient is a woman, then grand-daughters exhibit better health. However, she also finds only small effects on grandsons, and no significant effect on the health of boys or girls when the pension recipient is a man. While it is difficult to see how market imperfections alone would produce these differential results, they are amenable to the interpretation that grandmothers are more altruistic than grandfathers, and more so towards girls. Indeed, the further finding that it is *maternal* grandmothers that are altruistic is, in view of paternity uncertainty, supportive of a biological basis for altruism.

3 The Data

3.1 Data and measurement

The data refer to 2400 rural households that contain 18382 individuals interviewed for the Pakistan Integrated Household Survey (PIHS) conducted by the World Bank in conjunction with the Government in 1991. 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). The dependent variable is, alternatively, the proportion of children in the household that attend school (H), and that engage in work that produces a marketable produce (L).[13] Both H and L are investigated since they are not exactly inverse. A substantial fraction of children are neither in school nor in work, and some children combine school and work (see Bhalotra 2003 for details). Since employment questions in the survey are put only to individuals that are 10 years or older, the sample is restricted to households that contain at least one 10-14 year old. Although information on school attendance is available for children 5 years and older, the analysis of schooling is

[13] This is the ILO definition of work. It includes explicitly waged work and unpaid work on household-run farms and enterprises. Individuals are classified as participating in work if they report having worked at least one hour in the week preceding the survey.

restricted to the 10-14 age group to permit direct comparison with the estimates for child labour.

The adult expenditures (A_j) analysed are on adult clothing and footwear (henceforth "adult clothing", A_1), tea and coffee (A_2) and tobacco (A_3).[14] Expenditure on each of the adult items is quite small (see Table 1), and measurement error is more problematic when the true quantities are small. For this reason, results are also reported for the aggregate of the three goods, which will be referred to as A_4. It remains useful to consider A_1, A_2 and A_3 separately both because using multiple adult goods increases the power of the test, and because the test is then not dominated by properties peculiar to the individual goods. For example, tobacco is potentially addictive and is a predominantly male good. Neither of these considerations applies to expenditure on adult clothing. All adult expenditures are normalized upon the number of adults in the household, with additional regressors describing the age-gender composition of the household included to allow for any scale economies.[15]

Demographic variables capture observed heterogeneity between households. These include the logarithm of household size, the proportions of household members in an exhaustive set of age-gender categories (under-10, 10-14, 15-24, 25-59 and 60-plus), years of schooling of the mother and father, gender and religion of the household head, an indicator for whether the household owns land, a measure of the size of the plot (zero if no land is owned), indicators for land tenancy arrangements (whether renting or sharecropping land), and an indicator for whether the household owns an enterprise. Wage rates for adults and children are obtained from community level questionnaires in which village leaders are asked what the going wage for agricultural activity is for adults and children.[16] Province dummies are included to account for spatial variation in prices. Indicator variables for the presence of a

[14] Alcohol expenditure is unavailable because alcohol is prohibited in Pakistan. While we cannot rule out the possibility that under-15s consume some tea or coffee, it is sufficient for our purposes that tea and coffee are predominantly consumed by adults.

[15] As it is not possible to assign expenditures to parents, as opposed to other adults, the investigation pertains to all-adults and all-children in the household. South Asian households typically consist of people with close biological ties.

[16] The child wage is missing for 22 of 151 clusters and the male wage for 3. Since a missing value for a community translates to missing values for every household in it (resulting in 1.6% of adult and 14.4% of child wage rates missing at the household level), missing values were imputed using other community level information such as whether there is a market, a shop, a post office, electricity, gas, and a bus running through the village. The imputation involves generating a predicted value from the best available subset of these data (see Little and Rubin, 1987).

primary, middle and secondary school in the community are also included in the model, and these may be thought of as proxies for the price of schooling. Some variations on this specification are explored in section 5.

3.2 Descriptive statistics

Table 1 presents relevant expenditure shares, work and school participation rates, and elasticities of these with respect to household living standards. Together, expenditures on the "adult goods aggregate", A_4, comprises 8.2% of the budget. The expenditure share of tobacco and tea & coffee, at 3.8%, slightly exceeds the expenditure share of education (ignoring the opportunity cost of education), which is 3.5%. Health is a luxury, and education almost so. The average percentage of children (age 10-14) in the household that participate in work and school is 32% and 52% respectively. 41% of households have at least one child in work and 63% have at least one child in school. A 10% increase in total expenditure per capita is associated with a 2.5% increase in the proportion of children in the household that attend school. In the simple unconditional formulation used here, the expenditure elasticities for child labour and schooling turn out to be approximately equal, with opposite signs. The opposite signs confirm that child labour is, overall, a "bad", be there some positive benefits to accumulating work experience. The reported elasticities confirm normality for the adult goods, which is required for them to be cast as reference goods in the m-demands (Browning 1998). In the case of tobacco, only 70% of households report positive expenditure. Since normality can only be defended within this group, the estimated model is for this sub-group, and selection issues are discussed in section 4.2.

Let us ask the raw data the question of interest: Is expenditure on adult consumption lower, on average, in households with at least one working child than in households with none? The results are striking (see Table 2, panel 1). Significantly *more* is spent on tobacco and tea & coffee in households with working children although less is spent on adult clothing. Panel 2 reports similar tests for school participation. Expenditure on adult clothing is again consistent with altruism, while expenditure on tobacco and on tea & coffee is invariant to whether or not children are in school, which is consistent with parental egoism. These are, of course, only unconditional correlations. More conclusive results are sought from the more formal econometric analysis to follow.

3.3 Identification and estimation

The estimated *m*-demands are

$$(6a)\ H = \lambda_j A_j + \delta_H Z + e$$

$$(6b)\ L = \phi_j A_j + \delta_L Z + u$$

where household-level subscripts are omitted to avoid clutter, H denotes schooling, L denotes child labour, A_j is a category of adult expenditure, Z are control variables detailed above, and the coefficients of interest are $\lambda_j = \beta/\alpha_j$ and $\phi_j = \gamma/\alpha_j$, where α_j is the preference weight on the adult good, j (see section 2.1).

In general, the reference good in an *m*-demand is endogenous just as, in a Marshallian demand function, total expenditure is endogenous (e.g., Deaton 1985, Browning 1998).[17] This paper follows Browning (1998) in using a polynomial (a cubic) in household income to instrument A_j. Income should not affect consumption given the level of the reference good (see section 2.3). Studies estimating Marshallian demands have similarly used income as an instrument for expenditure (Browning 1998: section 6.2, Blundell *et al* 1998, Browning and Chiappori 1998) on the grounds that it is correlated with expenditure but uncorrelated with infrequency of purchase and with measurement error in expenditure (e.g. Keen 1986).[18] To investigate whether the IV strategy is robust to non-separability of adult leisure and child consumption, estimates conditional on adult labour supply are also presented (section 5). If I ignore this and parents with a taste for expenditure on children work harder, then the error in the child expenditure equation will be correlated with household income, an issue that is often neglected

Estimation is initially by the two-step efficient generalised method of moments estimator (GMM). This is more efficient than 2SLS and robust to heteroskedasticity of unknown form, as well as to arbitrary intra-cluster correlation (see Wooldridge 2002: p.193). Since households living in close geographic proximity

[17] There are two sources of correlation between A_j and e (or u) in (6). One arises from using the actual rather than predicted level of A_j in (6), and the other from heterogeneity, which induces a correlation of the error in the human capital equation with the error in the adult expenditure equation.

[18] The assumption that validity of the income instrument rests upon is that the dispersion of households over the same budget surface is independent of income. Households can have

will tend to have some unobservables (like climate, soil or culture) in common, the reported standard errors are adjusted to allow for intra-cluster correlations (see Deaton (1997), Chapter 2). The Hansen-Sargan J statistic, a version of the Sargan statistic that is robust to heteroskedasticity, is presented as a test of the joint null hypothesis that the excluded instruments are valid (see Davidson and McKinnon 1993: pp.235-36). Since the instruments are the level, the square and the cube of income, a test of overidentifying restrictions may be seen a test of functional form.[19] Although the IV are, in no case rejected, they are weak in some specifications. The F-test of the income instruments in the first stage is 8.65 in the equation that conditions on adult clothing. It is larger (and >10) for the adult goods aggregate, and smaller for tea & coffee and tobacco (see Table 2, panel 1). When there is a single endogenous regressor, a first-stage F statistic smaller than 10 indicates that the instruments are weak (Stock & Watson 2002, p.350). In this case, the asymptotic approximations that we rely upon when making inferences about coefficients on endogenous variables are unsatisfactory (see Bound, Jaeger and Baker 1995, Staiger and Stock 1997). Following Moreira (2002) and Moreira and Poi (2003), valid tests of the structural coefficients estimated by 2SLS and LIML are obtained, together with critical values of the Wald and likelihood ratio tests that yield correct rejection probabilities even when the instruments are weak. The LIML estimates (Davidson and MacKinnon 1993, pp. 644-51) are reported in preference to the 2SLS estimates since they are known to perform better with weak instruments.[20] Figure 1 shows that the asymptotic confidence intervals are similar to the size-correct confidence intervals when the dependent variable is schooling. However, when the dependent variable is child labour, then for reference goods tea & coffee and tobacco, the asymptotic intervals are too narrow.

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different incomes even if they have the same total expenditure so that instrumenting exploits variations between budget surfaces to identify the *m*-demand parameters (Browning 1998).

[19] In particular, if the Hansen-Sargan test had rejected the instruments, this would be an indication that the benchmark model (equation 9) is not linear, and that it should probably include higher-order terms in A_j. Functional form was directly investigated (see section 5 below) and the linear model could not be rejected. Given linearity of the model, the test is a valid test (has correct size) since the three income terms are linearly independent- but it may have low power.

[20] The 2SLS results are very similar. Although the LIML estimates do not allow for clustering of standard errors (which the GMM estimates do), the LR test has been shown by Moreira (2002) to be robust to departures from normality.

4 The Results

4.1 Main Results

Refer Table 3 (full results available on request). The LIML estimates are generally larger than but insignificantly different from the GMM estimates. Comparison of the GMM and LIML estimates with their OLS counterparts (panel 3) establishes the importance of allowing for endogeneity of the reference good. The OLS coefficients are biased downward in every case. Indeed, OLS estimates of the coefficients on expenditures on tea & coffee and tobacco are insignificantly different from zero, while the corresponding GMM relations are negative. This suggests that heterogeneity outweighs the income relation and what we are observing in the OLS equations is that households that have more children in work are also households that spend more on stimulants.[21]

Consistent with altruism, the coefficient on adult expenditure is positive for schooling (*H*) and negative for child labour (*L*), with one notable exception, discussed in section 4.2. Child schooling is a normal good, marginal increases in income being used to buy more schooling and less child labour at the same time as greater adult consumption. Thus, there is little support for the hypothesis of parental exploitation discussed in section 1. Using sample averages of expenditures (reported in Table 1), the estimates imply that a 10% increase in expenditure on adult clothing is associated with an increase in the proportion of children in school of 0.058 (or six percentage points), and a decrease in the proportion of children in work of 0.026 (or three percentage points).[22]

The *ratio* of the marginal effects of adult expenditure on work and school is, as we may expect, similar for the other adult reference goods (see columns 2 and 4 of Table 3).[23] This ratio is close to half, suggesting that the "weight" on child schooling is about twice that on child labour. Recall that schooling and child labour are neither mutually exclusive nor exhaustive categories (section 3.1). When household income

[21] *M*-demand estimates of Canadian household demands that use an identification strategy similar to that used in this paper are reported in Browning (1998). There too, heterogeneity outweighs the income relation, producing a significant bias in the OLS estimates.

[22] These estimates correspond to $(\partial H/\partial \log A_1)$ and $(\partial L/\partial \log A_1)$. The corresponding elasticities, $(\partial \log H/\partial \log A_1)$ and $(\partial \log L/\partial \log A_1)$, are estimated, using sample averages of the means of H, L and A_1 (reported in Table 1), to be 1.11 and -0.74. Neither of these numbers is significantly different from unity in absolute terms.

[23] In other words, $(\partial L/\partial A_1)/(\partial H/\partial A_1)$= -0.006/0.013 and $(\partial L/\partial A_2)/(\partial H/\partial A_2)$= -0.027/0.061, so $(\partial L/\partial H) \approx -0.5$.

increases, some of the additional school enrolment may come from "inactive" children (i.e neither in work nor in school), while some may come from children who reduce work-hours but continue to engage in work. Indeed, this is exactly what is found in an analysis of the effects of a subsidy offered to parents conditional on sending their children to school in Bangladesh (see Ravallion and Wodon 2000). In the current sample from Pakistan, as many as 42% of girls and 14% of boys in the age group 10-14 report inactivity (see Bhalotra 2000). This is a phenomenon observed across Africa and Asia (Bhalotra 2003).

Estimates of Marshallian demands corresponding to the *m*-demands are reported in Table 6 and discussed in section 5 below. They imply that a 10% increase in total expenditure per capita is associated with an increase in the proportion of children in school of 0.04 (or four percent points), and a decrease in the proportion in work of 0.016 (or two percent points). Notice that the ratio of effects is again close to half. Thus Marshallian estimates of the parameter, $\partial H/\partial A_j$ (or $\partial L/\partial A_j$) are similar to the *m*-demand estimates. The fact that the effect of *total* expenditure (*m*) on schooling is, at 0.04, smaller than the effect of *adult* expenditure (A_j) on schooling (0.058) is unsurprising since the latter is equivalent to the former divided by the effect of total expenditure on adult expenditure (see section 2.4, equation 5).

4.2 Smoking and investment in children

Amongst the eight coefficients reported in Table 3, there is one anomalous result. When the dependent variable is child labour (*L*) and the reference good is tobacco (A_3), the GMM estimates show a negative coefficient that is significant at the 10% level, but the conditional LR test of Moreira (2002) shows that we cannot reject the null that this coefficient is zero (also see Figure 1). So, in this one case, we cannot reject parental egoism.

A special feature of column 3 in Table 3 is that, in order to meet the requirement that the reference good is normal (refer section 2.3), the sample of households is restricted to the 70% that report positive expenditure on tobacco. We cannot simply reject altruism for households with smokers because the same restricted sample shows the expected positive association of school attendance with tobacco expenditure. It therefore seems that selection into the sample of smoking households is correlated with unobservables in the child labour equation (though not with unobservables in the schooling equation). To investigate the tobacco effect further,

alternative estimates that use the whole sample and incorporate a dummy for smokers to allow for non-linearity at zero consumption were obtained (see Table 4). The coefficient on tobacco expenditure is now significant (even by the adjusted LR test), and its sign consistent with altruism. The dummy is negative in the schooling equation, and positive in the child labour equation. Using these estimates, predictions are obtained for the levels of schooling and child labour in households that do and do not purchase tobacco. Table 4 shows that, on average, after controlling for the level of adult consumption and for demographics, child labour is higher and school attendance is lower in households with a smoker. This is consistent with the raw data described in section 3.2. Overall, these results suggest that children are worse off, on average, in households with a smoker.

5 Robustness and Alternative Specifications

This section considers robustness to model specification and alternative estimators. It investigates income pooling when children work, and robustness of the main results to the presence of child labour, and to non-separability of adult labour. It allows for endogenous fertility, and for alternative functional forms and alternative definitions of the main variables. For parsimony, results displayed in this section (Tables 5-7) are for the case where adult clothing is the reference good, and the benchmark model is that in column 1 of Table 3.

It has been assumed here, and in most previous research, that the child has no decision-making power in the household but child labour may generate bargaining power (see Moehling 2004, Bhalotra and Attfield 1998). This is explored here by modelling expenditure on an assignable child consumption category, child clothing, as a function of log total expenditure per capita and the proportion of children in the household in work. The latter variable represents the share of income contributed by children and is therefore an index of their bargaining power. Under the null of income pooling, the coefficient on this variable is zero. Under alternatives such as a bargaining model in which working children claim a greater share of resources, the coefficient on this variable is positive. Results are in Table 5.[24] The hypothesis of a

[24] Total expenditure is instrumented with a cubic in income (as, for example in Blundell et al 1998). Additional instruments used to allow for the potential endogeneity of the child labour term are the community-level wage rates for children and adults, and indicators for the

positive coefficient is decisively rejected (by OLS, LIML and GMM estimates). The coefficient on the child labour variable is insignificantly different from zero, consistent with income pooling. As a further check on this, the *m*-demand for schooling was estimated on the sample of households in which no child works, and the coefficient $\partial H/\partial A_j$ was not significantly different from that obtained on the full sample. Results are in column 1, Table 7.

Recall that the strategy of using income as an instrument for adult consumption in the equation for child labour relies upon assuming separability of adult and child labour. While this is quite standard in the literature, it is questionable (see Bhalotra 2002). Table 7 shows estimates that condition on adult labour supply, first total, and then separating adult males and females. The parameters of interest, $\partial H/\partial A_j$ and $\partial L/\partial A_j$, are not significantly changed. Consistent with altruism, the coefficient on adult labour is positive in the child labour equation, and negative in the schooling equation. In other words, the data show that child labour is associated with a cutting back of adult consumption *and* leisure (and conversely, in the case of schooling). There is no significant difference in the coefficients on adult male and female labour supply. In columns 2 & 3, parental labour is assumed exogenous, which is common in many theoretical and empirical studies of child labour. In columns 4 & 5, it is instrumented with the education and age (and interactions thereof) of the parents (these are conventional instruments; see, for e.g., Browning and Meghir 1991). The results are robust to this variation.

Although economists acknowledge that fertility is a choice variable, this is commonly ignored in empirical work, and household size is typically treated as an exogenous control variable. A justification of this is to argue that conditioning on size produces a short run effect, which may usefully be compared with the corresponding long run relation by omitting size (e.g. Deaton 1997: p. 221). Dropping size[25] produces the results in column 6, Table 7, which show robustness of the key coefficient to this change.

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presence of primary, middle and secondary schools in the community. Tests on the instruments are reported in the Tables.

[25] Household size is not the same as fertility. However, in rural households that contain non-nuclear families, adult membership of the household is likely to be correlated with choices over the quantity and quality of children. It is therefore cleaner to allow for the endogeneity of total household size.

Table 6 reports estimates of Marshallian demands for each of the child outcomes *(H, L)* and adult clothing expenditure, A_1 (refer section 2.4). The ratio of the income effects from the Marshallian demands produces a point estimate that is larger but not significantly different from the corresponding *m*-demand estimate of the key parameter, $\partial H/\partial A_1$, or $\partial L/\partial A_1$ (see Notes to Table 6).

The square of expenditure on the reference good was included as an additional regressor but in no case was it significant. This is backed by the Hansen-Sargan tests (see footnote 26). I also investigated a specification in which all expenditures are in logarithms (Table 7). The elasticities derived from these models are not significantly different from unity (see Wald tests in Table 7), consistent with a Cobb-Douglas specification. The pattern of coefficients in the logarithmic model is the same as in the main results. As the dependent variables are proportions, I investigated robustness to using the two-limit tobit estimator. As the results were similar, they are not shown. Alternative equations using average hours in work and school instead of the proportion of participating children in the household were also estimated, with qualitatively similar results (results available on request).

5 Conclusions

This paper produces estimates of the contemporary sharing of household resources between adult consumption and child schooling or, in an alternative specification, child labour. It finds that increases in adult consumption are positively associated with the proportion of children in the household who attend school, and negatively associated with the proportion who are engaged in work. These results obtain in a number of specifications of the model, including one in which adult labour supply is held constant. The finding that increases in child labour are associated with decreases in adult consumption allows us to reject the view prevalent in some previous research (see section 1) that parents make child labour choices with a view to their personal gain. These results are non-trivial, given previous rejections of altruism (see section 1). The paper also presents evidence that, as is commonly assumed, the earnings of working children are pooled with other household income. There is some indication that, at given living standards, households in which tobacco is consumed are more likely to engage their children in labour. The results of this paper are relevant to the vast body of research in which parental altruism is axiomatic. They are also relevant

to policy since, if altruism were weak, then policies that constrain the behaviour of parents- like legislative interventions or conditionality in cash transfers- would gain strength.

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Table 1

Descriptive Statistics

	Mean across households	Standard deviation	Expenditure elasticity
Budget shares:			
Adult clothing & footwear (A_1)	0.043	0.035	0.76
Tea & coffee (A_2)	0.018	0.014	0.60
Tobacco (A_3)	0.020	0.028	0.43
Adult expend ($A_4=A_1+A_2+A_3$)	0.082	0.051	0.68
Child clothing & footwear (C)	0.029	0.024	0.79
Food	0.537	0.165	0.74
Education	0.035	0.053	0.96
Health	0.103	0.137	1.13
Ceremonies	0.031	0.065	1.20
Prop. children in household in work	0.324	0.422	-0.27
Prop. children in household in school	0.518	0.445	0.25
Prop. households with at least 1 child in work	0.410	(0.492)	-0.11*
Prop. households with at least 1 child in school	0.628	(0.483)	0.11*
Expenditure in Rupees:			
Total expenditure per capita (*m*)	500.72	492.84	
Adult clothing & footwear (A_1)	43.56	45.98	
Tea & coffee (A_2)	17.65	15.77	
Tobacco (A_3)	19.35	29.95	
Adult expend: aggregate of above three items (A_4)	80.55	65.93	
Child clothing & footwear (C)	26.71	27.00	

Notes: N=1340 households. The figures in columns 1-2 are means and standard deviations of shares of total household expenditure. The elasticities in column 3 are obtained as θ from simple regressions of the form $\ln X_k=\theta \ln X+u$, where X_k is normalised expenditure for each item in column 1 and X is total expenditure per capita. For the adult goods, the natural normalisation of expenditure is per adult. For child clothing and education, it is per child. For food, health and ceremonies, it is per household member. A * indicates marginal effects of the log of total expenditure per capita obtained from a probit with dependent variable defined as unity if at least one child in the household works (or attends school). Every reported elasticity is statistically significant. A substantial fraction of households report zero spending on tobacco, ceremonies, health and education. In these cases the expenditure elasticity is computed for the sub-sample of households that record positive expenditure. The means of rupee expenditure are used to calculate elasticities using the estimated coefficients in Table 3.

Table 2

Is Adult Consumption Sensitive to whether Children are in Work or School?
Tests of differences in means

Adult Expenditure (per adult):	(1) **Difference: $E_0 - E_1$**	(2) **t-statistic**	(3) **p<t: H_A: diff<0**	(4) **p>|t| H_A: diff ¹ 0**	(5) **p>t H_A: diff>0**
Panel 1: [Child labour, L]					
Adult clothing and footwear (A_1)	4.89	1.92	0.97	0.06*	0.03*
Tea and coffee (A_2)	-1.34	-1.53	0.06*	0.13	0.94
Tobacco (A_3)	-2.95	-1.78	0.04*	0.08*	0.96
"Adult goods": aggregate of the above (A_4)	-0.62	-0.08	0.47	0.94	0.53
Tobacco: sub-sample with exp>0 (A_3)	-0.91	-0.43	0.34	0.67	0.67
Panel 2: [Child schooling, H]					
Adult clothing and footwear (A_1)	-5.18	-2.00	0.02*	0.05*	0.98
Tea and coffee (A_2)	0.34	0.38	0.65	0.71	0.35
Tobacco (A_3)	0.32	0.19	0.58	0.85	0.42
"Adult goods": aggregate of the above (A_4)	-18.62	-2.31	0.01*	0.02*	0.99
Tobacco: sub-sample with exp>0 (A_3)	0.02	0.01	0.50	0.99	0.50

Notes: The sample is divided into the 791 (41%) households in which at least one child aged 10-14 is reported as working in the reference week (group 1), and the remaining 549 (59%) households with no child labour (group 0). Column 1 reports the difference in adult expenditure between these two samples. A negative difference indicates that more is spent on adult consumption in the average household when children work- contrary to what is expected under altruism. Column 2 presents the t-statistic associated with this difference. The null hypothesis is that the difference is zero. The p-values in columns 3-5 indicate whether the difference is statistically significant for the 1-tailed and 2-tailed tests defined in terms of the alternative hypotheses, H_A. The analysis is repeated in Panel 2 of the Table, with sub-samples defined as the 842 (63%) households in which at least one child attended school in the reference week, and the remaining 498 (37%) households. If schooling is a good, while child labour is a bad, the signs are now in reverse. A negative difference indicates that more is spent on adult consumption in the average household when children attend school- and this is consistent with altruism. All expenditures are in Rupees per adult to allow for differences across households in the number of adults. Since 30% of households exhibit zero expenditure on tobacco, t-tests are presented separately for the sub-sample of households that report positive tobacco expenditure.

Table 3

Child Schooling & Child Labour

GMM & LIML Estimates of M-Demands

SCHOOLING (H)	**Adult clothing**	**Tea & Coffee**	**Tobacco (smokers)**	**Adult goods**
Panel 1: GMM Estimates	(A_1)	(A_2)	(A_3)	(A_4)
Adult expenditure (*x10*)	**0.132****	**0.606****	**0.146***	**0.084****
	[0.034]	[0.221]	[0.064]	[0.021]
Hansen's J χ^2; p-value	3.60; 0.17	0.90; 0.64	1.61; 0.45	2.67; 0.26
1st stage F on IV; p-value	8.65; 0.00	4.59; 0.01	6.42; 0.00	11.94; 0.00
Panel 2: LIML Estimates				
Adult expenditure (*x10*)	0.154**	0.685**	0.171**	0.095**
	[0.046]	[0.259]]	[0.060]	[0.026]
LR test; 95% critical value	35.99; 5.41	40.21; 5.21	19.30; 4.56	37.03; 5.05
Wald test; 95% critical value	12.50; 3.57	7.48; 2.82	8.24; 2.92	14.52; 3.53
Panel 3: OLS Estimates				
Adult expenditure (*x100*)	0.096**	0.043	0.057	0.046*
	[0.038]	[0.081]	[0.051]	[0.022]
R-square	0.19	0.16	0.16	0.16
CHILD LABOUR (L)				
Panel 1: GMM Estimates				
Adult expenditure (*x10*)	**-0.059****	**-0.267***	**-0.055+**	**-0.038****
	[0.021]	[0.131]	[0.031]	[0.013]
Hansen J χ^2; p-value	1.65; 0.44	1.49; 0.48	1.04; 0.59	1.32; 0.52
1st stage F on IV; p-value	8.65; 0.00	4.59; 0.01	6.42; 0.00	11.94; 0.00
Panel 2: LIML Estimates				
Adult expenditure (*x10*)	-0.060**	-0.291**	-0.076+	-0.039**
	[0.026]	[0.149]	[0.041]	[0.016]
LR test; 95% critical value	7.13; 4.68	7.36; 5.20	*4.23; 4.56*	7.25; 4.37
Wald test; 95% critical value	5.31; 3.36	3.77; 2.82	3.38; 2.90	5.57; 3.44
Panel 3: OLS Estimates				
Adult expenditure (*x10*)	-0.067**	0.035	-0.064	-0.029
	[0.024]	[0.081]	[0.050]	[0.018]
R-square	0.12	0.11	0.12	0.12
N	1327	1327	927	1327

Notes: The dependent variable is the proportion of children 10-14 years in the household that attend school and work respectively. See section 4.3 for details of the estimators and tests. Robust standard errors in brackets. + significant at 10%; * significant at 5%; ** significant at 1%.

Table 4
Do Children Get Less in Smoking Households (A_3>0)?
Tests of *conditional* mean differences

	Schooling	**Child labour**
Regression estimates		
tobacco expenditure	**0.252****	**-0.110***
	[0.111]	[0.050]
1(tobacco>0)	**-0.744****	**0.392***
	[0.300]	[0.153]
Hansen J χ^2; p-value	2.69; 0.26	1.05; 0.59
1st stage F on IV; p-value	3.31; 0.04	3.31; 0.04
T-tests		
Difference: C_0 - C_1	0.22	-0.31
t-statistic	5.96	-21.0
p<t: H_A: diff<0	1.00	0.00
p>|t|: H_A: diff≠0	0.00	0.00
p>t: H_A: diff>0	0.00	1.00
% change	-32.1	300.0

Notes: the reference good is tobacco expenditure. This is similar to column 3 of Table 3 except that now all households are used and a dummy variable (D_S) is defined which equals unity for the 927 (70%) households that report positive expenditures on tobacco and zero for the remaining 400 (30%) households. So $C = \gamma_3 A_3 + \gamma_S D_S + \theta Z + e$. Row 2 shows that γ_S<0. The predicted level of C in a smoking household (D_S=1) is $C_1 = \gamma_3 A_3 + \gamma_S + \theta Z$ and the predicted C in a non-smoking household (D_S=0) is $C_0 = \theta Z$. The mean difference is (C_0 - C_1), reported with its t-statistic. The null hypothesis is that the difference is zero. The p-values indicate whether the difference is statistically significant for the 1-tailed and 2-tailed tests defined in terms of the alternative hypotheses, H_A. The final row indicates the size of the difference. This is defined as (C_0 - C_1)/ C_0, expressed in percentage terms.

Table 5

Investigating the Income Pooling Assumption

	(C_1/A_1)	$\ln(C_1)$
Prop. of children in work (C_3)	-146.483	-1.925
	[414.021]	[1.110]
Ln p.c. expenditure (*x100*)	-46.763	0.441
	[103.454]	[0.313]
Hansen J $\chi^2(6)$; p-value	4.56; 0.60	10.39; 0.11
1st stage F on IV; p-value	18.29; 0.00	17.30; 0.00

Notes: Refer section 6 of the text. Also see notes to Table 3. C_1/A_1=Expenditure on child clothing/expenditure on adult clothing $\ln(C_1)$=log expenditure on child clothing. These are GMM estimates.

Table 6

Marshallian Demands

	Child school, H	**Child labour, L**	**Adult clothing, A_1**
household expenditure p.c. *(m)*	0.0079**	-0.0032*	0.044***
	[0.0021]	[0.0014]	[0.013]
Hansen J $\chi^2(2)$; p-value	5.00; 0.082	2.12; 0.35	2.15; 0.34
1st stage F (IV); p-value	17.32; 0.00	17.32; 0.00	25.51; 0.00

Notes: See Notes to Table 3, and sections 3.4 and 6 of the text. The coefficients in columns 1 and 2 are multiplied by 10 (as they were in Table 3). These estimates imply that $\partial H/\partial A_1 = (\partial H/\partial m)/(\partial A_1/\partial m) = 0.018$, which is not significantly different from the coefficient of 0.013 obtained from the *m*-demand in Table 3. Similarly, the ratio of the Marshallian demand coefficients in this Table implies $\partial L/\partial A_1 = -0.0073$, which is not significantly different from the *m*-demand coefficient of -0.0059 in Table 3.

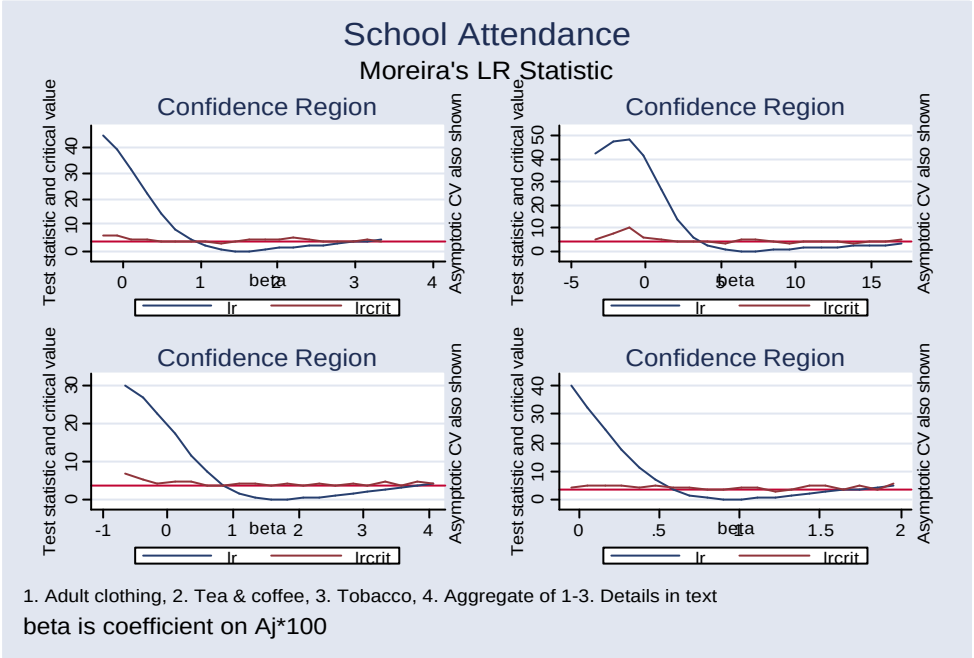
Table 7

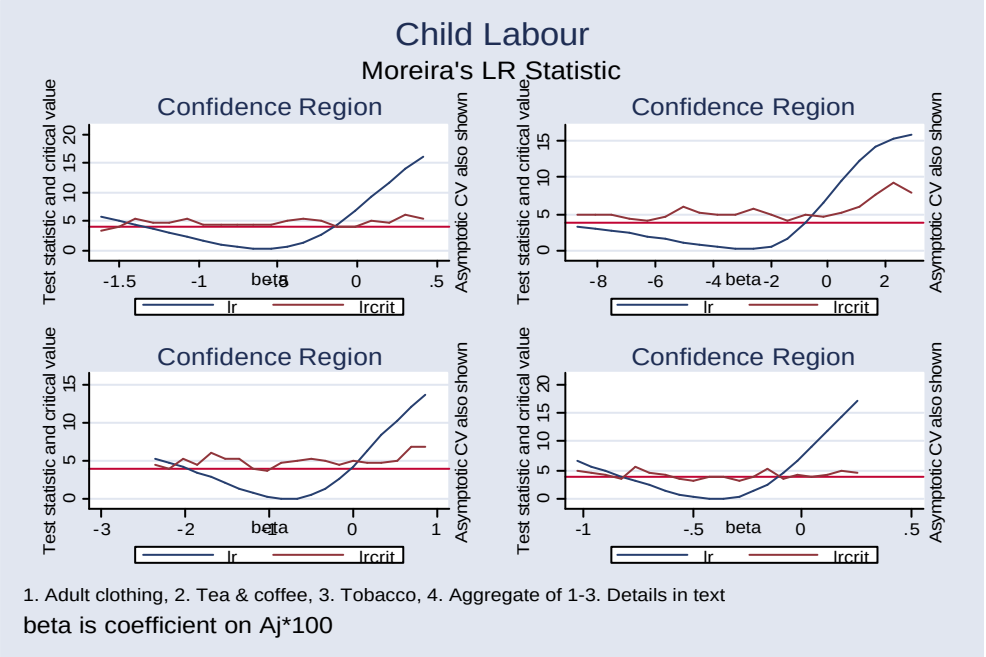
Alternative Specifications

	Sub-sample with no child labour	Control for adult labour (exog)	Control for male and female adult labour (exog)	Control for adult labour (IV)	Control for male and female adult labour (IV)	Drop household size	Expenditure in logs
Dependent variable: school (H)							
Adult clothing expenditure (A_1)	0.108**	0.148**	0.144**	0.154**	0.131**	0.118**	**0.486****
	[0.037]	[0.044]	[0.043]	[0.031]	[0.034]	[0.039]	[0.140]
Adult labour		-0.218**		-0.180			
		[0.079]		[0.333]			
Adult female labour			-0.118*		-0.498		
			[0.048]		[0.393]		
Adult male labour			-0.147*		0.254		
			[0.061]		[0.359]		
Hansen J χ^2; p-value	1.49; 0.47	0.29; 0.87	0.28; 0.87	8.23; 0.31	7.98; 0.24	3.28; 0.91	6.14; 0.06
1st stage F on IV; p-value	5.12; 0.01	7.63; 0.00	7.62; 0.00	6.85; 0.00	6.47; 0.00	4.76; 0.00	7.14; 0.00
Wald test elasticity(γ)=1: $\chi^2(1)$; p-value							0.05; 0.82
Dependent variable: child labour (L)							
Adult clothing expenditure (A_1)		-0.057*	-0.053*	-0.065**	-0.056**	-0.074**	**-0.296****
		[0.026]	[0.022]	[0.017]	[0.021]	[0.028]	[0.091]
Adult labour		0.439**		0.415*			
		[0.048]		[0.192]			
Adult female labour			0.282**		0.371		
			[0.026]		[0.301]		
Adult male labour			0.101*		0.103		
			[0.039]		[0.235]		
Hansen J χ^2; p-value		0.19; 0.91	0.04; 0.98	11.10; 0.13	11.04; 0.09	4.62; 0.10	6.02; 0.05
1st stage F on IV; p-value		7.63; 0.00	7.62; 0.00	6.85; 0.00	6.47; 0.00	4.76; 0.00	7.14; 0.00
Wald test elasticity(γ)=1: $\chi^2(1)$; p-value							0.10; 0.76
N	780	1324	1312	1324	1312	1318	

Notes: See Notes to Table 3, which presents the benchmark model. All estimates are GMM. The C-statistic that tests the additional restrictions implied by the instruments used for adult labour is 7.99 (p-value=0.24) in the schooling equation and 11.1 (p=0.11) in the child labour equation, which confirms that the instruments are valid. The estimated coefficients in the last column correspond to ∂H (or ∂L)/$\partial \log A$ and so the elasticities, $\partial \log H/\partial \log A$ (=0.94) and $\partial \log L/\partial \log A$ (=0.91), can be derived by dividing these coefficients by the mean of H (0.518) or L (0.324).The Wald tests are of the null that the elasticity is 1 (–1 in the case of child labour).

Figure 1: Conditional Likelihood Ratio Test Statistics and Critical Values Adjusted for Weak Instruments





Notes: See Section 4.3 of the text. Beta is the (scaled) coefficient on the adult expenditure. The asymptotic critical value (CV) is the flat line (lr), the adjusted CV is the jagged line (lrcrit) and the confidence region is the region of the graph where the observed statistic (the smooth curve) lies below its critical value.