Demand or Supply for Schooling in Rural India?

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Preliminary, Please do not cite. Comments are welcome.

*This paper would not have been possible without the very generous help of Dr. Indira Hirway, Director and Professor of Economics, Centre for Development Alternatives, Ahmedabad, India. Professor Hirway was instrumental in the design of the Indian Time Use Survey and her assistance in obtaining and interpreting the micro data from this survey is deeply appreciated.

Abstract

This paper examines the education decisions of rural households in India, presents new evidence on informal instruction of children in the home and assesses the relative importance of household attributes and local educational quality for school attendance and human capital investment time. Micro-data from the 1998-99 Indian Time Use Survey (ITUS) conducted in Gujarat, Tamil Nadu, Madhya Pradesh, Meghalaya, Orissa and Haryana (covering 77,593 persons in 18,591 households) are matched to state level data from the 7th All India School Education Survey (AISES) on school quality and availability. Probit models of the determinants of school attendance and sample selection bias regression models of the total time invested in human capital acquisition by boys and girls (ages 6 to 10, 11 to 14 and 15 to 18) in rural India are estimated. The implications for school attendance and human capital investment time of scheduled caste status, parental education less than high school, household income less than median and school quality less than Tamil Nadu are simulated. Poor quality of local schools emerges as a crucially important negative influence on school attendance.

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"The crucial role of human capital makes it all the more essential to pay attention to the close relation between sensible public action and economic progress, since public policy has much to contribute to the expansion of education and the promotion of skill formation. The role of widespread basic education in those countries with successful growth-mediated progress cannot be overemphasized."

J. Dreze and A.K. Sen *India: Development and Participation* (2002:75)

The value of education for development is increasingly recognized – both in the instrumental sense of enabling rapid growth in GDP and in the direct attainment of human self-consciousness and capability. However, within India – and particularly within rural India – the distribution of educational opportunities and attainment is highly unequal. Schools in tents or outdoors or with absentee teachers coexist with schools whose teachers and resources are "world class" in quality – and there is substantial variation across states within India in the average level, and the inequality, of quality in local schools. Although no individual family can decide the nature of their local school system, those systems are the product of a collective choice, which constrains individual choices. Even given the educational alternatives available to them in their local area, individual families may make very different decisions regarding their children's schooling – choices which will have enormous implications for their children's lives. This paper therefore asks the question: whose choices matter more? How much of the inequality in human capital investment in rural India can be explained by variation in the availability and quality of local schooling, and how much can be attributed to variation in the attributes and choices of students and households?

Section 1 begins with a brief description of our data sources – the Indian Time Use Survey of 1998-99 and the 7th All India School Education Survey (AISES) – and an overview of school quality, attendance and informal instruction in India. Section 2 then presents probit estimates of the probability of school attendance while Section 3 uses sample selection bias regression techniques to examine the determinants of total human capital investment time (i.e. time spent in school plus travelling to and from school plus

homework and in-home instructional time). Section 4 uses these estimates to compare the magnitude, and the inequality, of the human capital investment which is influenced by inequality in access to school facilities, relative to the impact of the social exclusion, low income or low education of Indian families. Section 5 concludes.

1.1 Data Description

Between June, 1998 and July, 1999, the Central Statistical Organization of India conducted a pilot Time Use Survey (the ITUS). A stratified random sampling design, as followed in the National Sample Surveys (NSS), was used to survey 18,591 households (12,750 rural and 5,841 urban) with 77,593 persons, of whom 53,981 were rural and 23,612 were urban residents. The survey was conducted in four rounds during the year to capture seasonal variations in the time use patterns of the population. Two person teams of male and female interviewers stayed in each village or urban block for nine days to compile time diaries for normal, abnormal and weekly variant days. Respondent households were first visited to assess their weekly pattern of time use and then revisited to complete a full diary of activities concerning the previous day for all household members over six years of age. The data set contains an individual record of the day's activities of each adult and each child over the age of six and a household level record of household characteristics – the common activities of household members can be identified by activity timing within the day and by the linkage of household identifiers. Although the sample design was explicitly constructed to capture differences in time use between normal and weekly variant or abnormal[i] days, in practice Hirway (2000:24) noted that "On an average, of the total 7 days, 6.51 were normal, 0.44 weekly variant day and 0.05 was abnormal day… in rural areas people continue their normal activities on holidays also." This paper therefore focuses on time use on "normal" days.

As Pandey (1999:1) noted: "India has lot of socio-economic, demographic, geographic and cultural diversities. To ensure that all aspects of diversities are captured, Haryana, Madhya Pradesh, Gujarat, Orissa, Tamil Nadu and Meghalaya were chosen to represent northern, central, western, eastern, southern and north-eastern regions respectively." Although some might wonder whether six states' data could fully capture the diversity of India, Hirway (2000:11) has argued "cross-checking of the results has confirmed that the sample is fairly representative of the country." In any event, this data

would be interesting even were this not the case, i.e. even if the data were only seen as a sample of the approximately 233 million people inhabiting these six states.

Because the state and district of the respondent are recorded in the ITUS micro-data, each respondent household can be exactly matched to state level data from the 7th All India School Education Survey (AISES), which collected comprehensive data on a census basis on every facet of school education in India, as of September 30, 2002[ii] - including the availability of schooling facilities in rural habitations, physical and educational facilities in schools, incentive schemes and beneficiaries, medium of instructions and languages taught, enrolment, teachers and their academic and professional qualifications, library, laboratory, ancillary staff and subject-wise enrolment at +2 stage of education. In addition, the enrolment and teachers in unrecognised schools, Alternative Schools and AIE Centers, Oriental Schools covering Sanskrit Pathshalas, Madarsas and Maktabs; Special Schools for children with disabilities, and Pre-primary Institutions are also covered.

Unfortunately, in states other than Gujarat we could not identify the district of residence, so we have had to make do (for the moment) with state wide average measures of school facilities. In order to enable a more exact match between individual households and the characteristics of their local school system, we hope to be able to use district level data in future work.

1.2 The Supply Side – Variation in School Availability and Quality

Within India, there is remarkable variation across states in school availability and quality. As Table 1 indicates, the fraction of schools that have an average pupil/teacher ratio over 50 is 2.2% in the state of Kerala and 0.2% in Goa, but reaches 58% in Uttar Pradesh and 78.8% in Bihar. In the state of Manipur, 54.3% of schools have either no building at all or one constructed of material such as unburned bricks, bamboos, mud, grass, reeds, thatch or loosely backed stones. In Arunachal Pradesh, 30.9% of schools are thus constructed but in Goa it is only 1.2% and in Kerala even less (0.6%).

Table 1
Indicators of School Quality in Indian States
AISES 2002

State or Union Territory	%PTR >50*	% No Building or Kaccha**
Andhra Pradesh	13.973%	12.631%
Arunachal Pradesh	14.585%	30.879%
Assam	23.332%	18.327%
Bihar	78.828%	8.843%
Chhattisgarh	31.460%	7.123%
Goa	0.193%	1.208%
Gujarat	10.352%	9.894%
Haryana	28.173%	0.376%
Himachal Pradesh	3.819%	10.232%
Jammu & Kashmir	6.770%	19.261%
Jharkhand	52.740%	7.770%
Karnataka	8.513%	3.642%
Kerala	2.150%	0.647%
Madhya Pradesh	23.624%	9.003%
Maharashtra	9.716%	2.109%
Manipur	10.110%	54.345%
Meghalaya	6.923%	23.001%
Mizoram	6.150%	32.409%
Nagaland	1.849%	37.578%
Orissa	28.465%	4.438%
Punjab	20.622%	0.623%
Rajasthan	31.378%	1.665%
Sikkim	0.000%	22.334%
Tamil Nadu	12.005%	2.961%
Tripura	12.269%	26.854%
Uttar Pradesh	57.971%	1.945%
Uttaranchal	13.897%	2.719%
West Bengal	44.035%	9.055%

* Percentage of primary schools (both rural and urban) where the Pupil to Teacher Ratio (PTR) is greater than 50.
** Percentage of rural primary schools without a building (tent or an open space) or with only a kaccha building.

For any individual household, the characteristics of their local school system are an exogenous constraint[iii]. Parents must make choices, on behalf of their children, about the productivity of investing time in human capital acquisition, in expectation of greater future earnings by their children – but where schools are unavailable or difficult to access, the option of continued school attendance may not be fully open. As well, where

schools are generally of low quality – either in physical facilities or teacher/student ratio or in teaching resources – reasonable parents may have systematically lower expectations of the productivity of spending time in school. As Hanushek et al (2006:1) conclude: "a student is much less likely to remain in school if attending a low quality school rather than a high quality school." For these reasons, we expect the probability of school attendance, and the total time invested in human capital acquisition to be, ceteris paribus, lower in localities with poorer, or less available, schools. However, as Handa (1999a:2) remarks: "even if regional variations in schooling infrastructure can be related to household schooling choices, as several studies have shown, efficient policy decisions require knowledge of the particular dimensions of school infrastructure that matter most."

1.3 Investing Time – Family Decisions about the Human Capital of Children

Each day, families must allocate the scarce resource of household time to the competing alternatives of direct production of goods and services, market work to produce cash income, investment in future productive capacity and "leisure". Because the importance of investment in the human capital of children has increasingly been recognized as a major determinant of economic development, and because inequality in access to such investment is central to the core ethical issue of equality of opportunity, time use data offers a unique window on both the efficiency and equity of the development process.

In the ITUS, every individual's principal status (e.g. working in the household, working as a casual labourer, student, etc.) is given – but because we also have direct information on whether an individual actually attends an educational institution, Table 2 can distinguish between school enrolment and actual school attendance. In both urban and rural areas, the fraction of children aged 6 to 18 who actually attended school on a normal day is about one fifth lower than the proportion identified as "student" – even if the higher enrolment of urban areas (about 75%) implies a somewhat larger absolute differential (15 percentage points).

As the top two rows of Table 2 illustrate, in both rural and urban areas roughly seventy percent of Indian children aged 6 to 10 attend school. In urban areas, the same proportion of both boys and girls remain in school for ages 11 to 14, and there is little gender differential in the drop to forty percent remaining in school when aged 15 to 18. In

the rural areas, however, gender differences in school attendance increase from five percentage points for 6 to 10 year olds to twelve percentage points among older age groups. In combination with a strong tendency for rural teens to leave school, this implies that by the age of 15 to 18 only about a fifth of rural girls are in school.

The importance of intergenerational influences shows up clearly in Table 2. The 15 to 18 year old children of casual labourers in urban areas have a thirty five percentage point lower chance of school attendance, compared to wage workers. And the school attendance rate of rural girls aged 11 to 14 nearly doubles (increasing from 32% to 61%) if there is a literate adult female in the household.

The ITUS records directly, for each child aged 6 or over, both time spent in informal learning in the home and in school attendance. To our knowledge, this paper offers the only available evidence in developing countries on the role which informal parental instruction may play in human capital acquisition. Historically, education outside school has sometimes been crucially important. In Scandinavia in the seventeenth century, for example, nearly universal literacy was achieved, as Johannson (1988: 137) notes, “almost completely without the aid of a proper school system in the countryside. The responsibility for teaching children to read was ultimately placed on parents and godfathers”. (A responsibility Swedish parents took seriously, given the possibility that Lutherans perceived of eternal damnation of the souls of the children who did not learn their catechism before confirmation, typically at age 13 or 14.)

Table 2

School Attendance & Enrolment

	Attendance								Enrolment	
	Ages 6-10		Ages 11-14		Ages 15-18		Ages 6-18		Ages 6-18	
	Boys %	Girls %	Boys %	Girls %	Boys %	Girls %	Boys %	Girls %	Boys %	Girls %
Total Urban	69.8	68.1	72.5	70.5	42.4	40.3	60.3	58.7	75.5	74.3
Total Rural	71.1	66.2	66.5	54.0	30.5	19.2	56.7	47.9	67.9	56.2
Household Type										
Urban										
1 Self Emp Prof	67.4	74.7	71.5	67.2	48.1	44.3	62.2	62.3	81.0	81.4
2 Self Non Prof	82.5	57.9	82.9	80.3	34.5	46.2	61.5	58.9	67.9	69.0
3 Wage Worker	75.7	75.0	81.2	75.2	53.3	47.9	69.1	65.2	84.3	83.2
4 Casual Labour	56.2	58.9	48.1	56.8	17.6	12.8	39.6	42.4	56.8	56.6
9 Other	66.5	87.1	79.3	72.2	63.2	51.2	70.1	63.6	87.5	74.6
Rural										
1 Self Emp Prof	68.3	74.0	73.6	62.0	33.5	18.9	60.5	55.0	77.6	64.7
2 Self Non Prof	74.7	67.2	51.9	66.5	38.5	26.2	59.2	56.4	76.0	69.8
3 Wage Worker	67.9	59.1	63.8	43.7	20.4	14.1	51.8	41.3	61.4	48.0
4 Casual Labour	74.2	69.6	61.7	56.9	34.5	17.9	57.8	48.5	67.4	55.6
5 Self Emp Agric	70.6	64.8	65.2	52.5	29.7	19.2	55.3	46.2	66.4	54.8
9 Other	79.6	83.2	84.4	71.8	52.3	31.8	72.1	64.6	83.8	73.8
Urban										
SC	66.7	53.5	65.5	48.2	25.7	31.5	51.5	44.2	65.9	68.1
Other Castes	71.3	70.5	73.6	73.0	44.9	40.6	62.0	60.1	77.5	75.0
Rural										
SC	73.3	69.8	69.7	57.4	33.3	19.6	59.8	51.7	69.2	60.2
Other Castes	74.5	70.9	68.3	58.3	33.1	21.5	58.9	50.6	71.4	59.8
Literate Adults (Age>15)										
Urban										
0	44.8	37.5	57.6	18.1						
>0	72.1	71.1	73.6	74.1						
Rural										
0	57.7	48.9	50.5	25.2						
>0	77.6	74.8	71.9	61.1						
Literate Adult Females										
Urban	56.2	56.0	57.7	44.3						
0	74.4	71.8	76.6	76.9						
>0										
Rural	66.4	55.6	59.1	37.6						
0	78.5	82.0	75.3	70.7						
>0										
Literate Adult Males										
Urban										
0	55.2	48.3	57.1	45.5						
>0	72.0	71.2	75.1	74.0						
Rural										
0	60.3	51.9	54.7	32.3						
>0	77.6	75.0	71.9	61.6						

The ITUS data also record the time each adult spent in Activity 521 "TEACHING, TRAINING AND INSTRUCTION OF OWN CHILDREN", as Table 3 reports. About 6% of rural, and 18% of urban, households report this activity on a randomly selected normal day – and when it occurs, families evidently take it seriously, with median time invested being a full hour. Since the time use diary methodology of the ITUS samples an individual day, we cannot distinguish the periodicity of episodes with this data (e.g. we cannot distinguish between the hypotheses that (a) 42% of rural households help with homework, but only for one day each week and (b) that 6% of rural households help with homework every day of the week.) Nevertheless, the difference between urban and rural families is apparent and strong within-family specialization is evident – with an interesting gender reversal between rural areas (58% male) and urban areas (58% female). About 90% of the time, it is the head of household, or spouse thereof, who instructs children – but in the remaining 10% of cases, it is married children within the household, or older siblings. And although it is clear from Table 2 that the literacy of adults strongly predicts school attendance, it is also clear that some illiterate parents do value their children's education strongly – 14% of the rural adults who spend time instructing their children try to do so despite their own illiteracy.

Because we can match the timing of informal adult educational activity with each child's record of whether they received instruction, we can tell which children within the household received informal adult attention, and who provided it. This paper focuses on the total time devoted to learning of each child, but because we can calculate both the aggregate amount and origin of informal instruction, we hope in future work to examine the determinants and the extent of any intra-family inequality in parental time invested in human capital.

Table 3
Time spent by households and individuals on:
521. TEACHING, TRAINING AND INSTRUCTION OF OWN CHILDREN

	Rural	**Urban**
% of Households which spend any time*	5.45%	17.14%
Of Whom:		
1 Adult is involved	91.10%	82.25%
2 Adults are involved	8.64%	17.32%
>2 Adults are involved	0.26%	0.43%
Of Whom:		
Scheduled Tribes	8.14%	1.88%
Scheduled Castes	11.46%	6.20%
Others	80.40%	91.91%
Median time spent by households (mins)**	60	60
% of adult individuals who spend any 521 time***	2.41%	8.03%
Of Whom:		
Men	57.55%	41.80%
Women	42.45%	58.20%
Non-Literate	14.05%	6.09%
Literate	85.95%	93.91%
Head of Household	47.63%	40.28%
Spouse of Head of Household	32.93%	49.67%
Married Child	8.42%	2.00%
Spouse of Married Child	5.49%	5.04%
Unmarried Child	2.36%	1.55%
Others	3.16%	1.45%
Median time spent by individuals (mins)****	60	60

* Percentage of households in which at least one adult (older than 18 years) spends some time on 521. .Percentages calculated over all households which have at least one child between 6 and 18 years of age.
** Calculated over positive values.
*** Calculated over individuals who live in households which have at least one child
**** Calculated over positive values.

In discussing the time which families invest in schooling, we would stress that we cannot assess in this paper the eventual *productivity* in higher future wages or other returns of the time invested in children's human capital[iv]. Our ITUS data only capture the *quantity* of time allocated to investment in education. School attendance is the largest single part of the total time devoted to learning of each respondent child – but it is only part of the time investment which families make in children's human capital. Children also must do homework, and travel to school – activities which the ITUS directly measures, in addition to time spent in class. Table 3A can therefore present a more complete picture, for each child, of the total investment of time than is available in other types of data – although median class time is consistently about 5 ½ hours on a "normal" day, the median child aged 6 to10 spends about 7 ½ hours on schooling, which rises to about 9 hours for those who remain in school when aged 15 to 18, when one counts homework and travel time.

Although the ITUS data contain no direct indicator of educational quality, many authors (e.g. Dreze and Sen, 2002) have emphasized the very uneven nature of schooling in India. An indirect indicator of such inequality may be the substantial variation in homework time – for example, among 15 to 18 year old boys in urban areas only about a third (33.9%) of all children (even fewer in rural areas) did any homework at all, but the median time of the 80% (= 33.9/42.4) of students aged 15 to 18 years old who did do homework was over 2 ½ hours! As well, when schools differ substantially in quality or availability, one can expect that student travelling time will be highly unequal, as some children will be able to attend the local school, while others must travel long distances in search of higher quality, or any available, schools. In the 15 to 18 age group, the median travel time (i.e. over positive travel times) was an hour a day.

Table 3A

Time (minutes) spent on schooling by children (711,721 and 791)*

	Ages 6-10		Ages 11-14		Ages 15-18	
	Boys %	Girls %	Boys %	Girls %	Boys %	Girls %
Urban						
% class time (711) >0**	69.8%	68.1%	72.5%	70.5%	42.4%	41.5%
Median over positive class times	300	320	315	330	315	325
Median over all homework (721) times	60	60	75	75	0	0
% of all children homework >0	58.7%	59.0%	62.5%	61.4%	33.9%	32.2%
Median over positive homework times	120	120	130	135	160	180
Median over all travel (791) times	30	30	30	30	0	0
% of all children travel >0	63.1%	62.2%	65.7%	64.1%	40.6%	37.1%
Median over positive travel times	40	40	45	45	60	50
Median Total (711+721+791) Time	450	480	480	510	525	510
Rural						
% class time (711) >0	70.1%	66.2%	66.5%	54.0%	30.5%	19.2%
Median over positive class times	330	330	330	330	330	330
Median over all homework (721) times	40	0	60	0	0	0
% of all children homework >0	55.4%	49.9%	56.5%	45.1%	26.5%	15.7%
Median over positive homework times	110	110	120	120	165	150
Median over all travel (791) times	20	15	20	0	0	0
% of all children travel>0	60.1%	54.1%	56.5%	45.4%	26.6%	16.9%
Median over positive travel times	30	30	40	40	60	60
Median Total (711+721+791) Time	450	450	495	495	540	540

* If a child does not attend school (i.e. if 711=0), his/her homework and travel times are set to zero.

** Calculated by dividing the number of children who have positive 711 time by the total number of children of that gender and in that age group (sample weights are used). All the percentages below are calculated in the same manner.

711. General Education: School/University/Other Educational Institutions Attendance

721. Studies, Homework And Course Review Related To General Education

791. Travel Related To Learning

2. The Probability of School Attendance

Since the primary way in which children acquire human capital is by school attendance, it is crucial to understand the factors influencing the chances that they will, or will not, go to school. In the US, or in other affluent OECD nations, the occupational and educational background of parents has long been recognized as the crucial determinant of children's educational attainment and the intergenerational transmission of socio-economic status.[v] However, the issue this paper seeks to address is the relative importance, in the context of rural India, of household level characteristics which influence the demand for education – compared to the quality and availability of educational supply. Affluent OECD countries all have well-developed systems of public education which provide universally available access to schooling of reasonably high quality – but India does not. Although there is much discussion of inequalities of educational opportunity in the school system within, for example, the USA, the disparities between US states in availability, physical facilities and teacher student ratios are far smaller than between Indian states.

The monetary incentive to invest time in the education of children is the increase in their future earnings – for present purposes we can summarize the expected future return in an individual's local labour market to the investment of an hour's current time, for "average" school quality, by some variable p_i (where the subscript i refers to the ith individual student). If schools are far away, or of low quality, students have to spend more time to get the same amount of learning, so a parsimonious way to think about the problem of school quality and availability is to assume that an index q can summarize the productivity of the actual time which students invest in human capital acquisition. Low quality (or high travel time) schooling implies $q < 1$, while schooling of "numeraire" quality implies $q = 1$ and high quality schooling can be represented by $q > 1$. The return to an hour invested in Human Capital Acquisition is therefore dependent on both p_i and q.

Using the AISES data we can get some measures of quality (q^*) at the state level, and if q^{**} is the district level measured quality of schools and there is variation in school quality across districts within a state we can represent that district level variation by v, such that $q^* = E(q^{**} + v)$. [vi] On any given day, a child of a particular age may not attend school either because they are not enrolled or because they are enrolled but absent

due to illness, other work obligations or the desire to skip school. It is reasonable to think that all these reasons for non-attendance are negatively related to both p_i and q. We include q^* as an explanatory variable, recognizing that within-state variability in local school quality will create attenuation bias, biasing downward the size and significance of any estimated coefficient.

Parental characteristics matter for school attendance both because some families may have a greater "taste" for the non-monetary returns to education and because families differ in their ability to finance the costs of education (in particular, the foregone earnings or agricultural output of child labour) and in their discount rate on the future monetary returns to education – we can summarize the family background characteristics which influence the demand of the ith child for schooling by a vector F_i. In general, both supply and demand for school will matter for school attendance and if S_i is the time a child spends in class, then:

$$(1) \qquad Prob\ (S_i > 0) = f\ (p_i\ ,\ q^*,\ F_i)$$

Table 4 presents the results obtained when a Probit model of school attendance of rural boys and girls, ages 6 to 10, 11 to 14 and 15 to 18 is estimated using the ITUS data. In Table 4, AISES data is used to construct variables indicative of the availability and quality of the school system within each state – specifically, the number of Primary or Primary and Upper Primary schools per-capita[vii], the number of secondary schools per-capita, the percentage of low quality primary schools (average pupil/teacher ratio over 50) and the percentage of schools with no building or a kuchcha[viii] facility. In each state, household micro-data is matched to the corresponding state wide indicators of the aggregate availability and quality of the local school system. A consistent finding in Table 4, with only a few exceptions, is the large and strongly statistically negative correlation between school attendance and our indicator of low quality school facilities and prevalence of high student/teacher ratios. For boys under 14, our availability measure (the number of primary and upper primary schools per capita) is not statistically significant – but it is significant for girls.

In Table 4, a [0,1] dummy variable identifies households in which there is no literate adult female. The importance of female literacy for the school attendance of

children comes through very strongly – for both boys and girls, for all age groups, this variable is very highly statistically significant and negatively correlated with school attendance.

The educational background of the head of each household is measured by a series of dummy variables indicating the marginal influence of schooling attainment, relative to lower levels of school attainment. The base case is a household head with no formal education, so a [0,1] dummy variable indicates whether an individual has some primary school, another [0,1] dummy variable indicates whether an individual has finished primary school, and another [0,1] dummy variable indicates whether an individual has finished middle school, etc. Anyone who has finished primary school will necessarily be coded [1] for both "some primary" and "finished primary", while a middle school graduate will be coded [1] for each of "some primary", "finished primary" and "finished middle school" – so the cumulative influence of education is the sum of coefficients at earlier levels of education.

It is evident that for both boys and girls aged 6 to 10, a crucial issue in attendance at primary school is whether or not one's parents have *any* education.[ix] Compared to the base case of no formal education, the dummy variable for "some primary" is a strongly significant determinant of school attendance for both boys and girls – but the statistical insignificance of higher levels of school attainment indicates that there is no particular difference among parents with higher schooling levels in their desire for primary school attendance by their children. However, for children aged 11 to 14, the crucial level of parental education shifts up – to primary school – i.e. parents with more than primary school are all alike in wanting at least a middle school education for their children. Similarly, the probability of school attendance for boys aged 15 to 18 increases with father's education over the range up to middle school. Broadly speaking, we can interpret these findings as indicative of an escalating intergenerational norm within families for more education.

The base category for household head occupational status is "labourer" and [0,1] dummy variables indicate whether the head is "self-employed" or "other" – only the "other" category is statistically significant.

Current household income is approximated in the ITUS by aggregate monthly expenditure per capita. Since the respondents to the ITUS were asked a single summary

question about total average monthly expenditures by the household (rather than the series of questions on categories of consumption which a household expenditure survey would use to add up total consumption) we are cautious[x] about possible measurement error in this variable – particularly since it is unlikely to include self-production of food and fuel. Nevertheless, if income is uncorrelated with the school attendance of boys aged 6 to 10 and 10 to 14 (columns 1 and 3), while the positive and statistically significant coefficients in column 2 and 4 indicate that family income matters for similarly aged girls, it is some evidence of gender bias in early schooling. More generally – over and above the direct influence of parental education – the strongly statistically significant positive correlation of household income and school attendance for both boys and girls ages 15 to 18 is an important indicator of inequality of opportunity.

Columns 1 and 2 indicate that the social disadvantage of membership in a Scheduled Caste or Tribe[xi] is directly correlated with lower early school attendance, in addition to the influence of household income or parental education, but columns 3 to 6 show no statistically significant correlation with later attendance. Although we include a dummy variable for Female Household Head status and another for landlessness, neither are statistically significant, once we have controlled for income and education.

Table 4
Probability of School Attendance – Rural India

(Probability > | *t* | in brackets)	Ages 6-10		Ages 11-14		Ages 15-18	
	Boys	Girls	Boys	Girls	Boys	Girls
Intercept	1.778	1.341	1.820	2.102	3.642	5.011
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age	-0.072	-0.049	-0.100	-0.179	-0.283	-0.383
	(0.00)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)
Married [0,1]					-0.603	-0.360
					(0.08)	(0.07)
Self-employed [0,1]	-0.045	-0.112	-0.073	0.020	0.129	0.049
	(0.52)	(0.14)	(0.37)	(0.82)	(0.11)	(0.65)
Other employment [0,1]	0.253	0.214	0.499	0.256	0.272	0.108
	(0.03)	(0.09)	(0.00)	(0.04)	(0.02)	(0.46)
Household head has below primary education [0,1]	0.286	0.220	0.231	0.164	0.177	0.043
	(0.00)	(0.02)	(0.02)	(0.09)	(0.07)	(0.74)
Household head has primary education [0,1]	0.034	0.045	0.036	0.273	0.103	0.165
	(0.74)	(0.67)	(0.75)	(0.01)	(0.33)	(0.24)
Household head has middle education [0,1]	-0.040	0.008	0.272	0.012	0.204	0.400
	(0.72)	(0.95)	(0.02)	(0.92)	(0.06)	(0.00)
Household head has secondary education [0,1]	0.176	0.095	0.103	0.174	0.013	-0.110
	(0.20)	(0.52)	(0.50)	(0.22)	(0.92)	(0.48)
Household head has higher secondary education [0,1]	-0.228	0.054	-0.145	0.040	0.194	0.243
	(0.23)	(0.81)	(0.51)	(0.86)	(0.32)	(0.24)
Graduate [0,1]	0.021	-0.090	0.393	0.106	0.057	-0.021
	(0.94)	(0.77)	(0.22)	(0.74)	(0.82)	(0.94)
Landless [0,1]	-0.065	-0.08	-0.089	-0.006	0.055	0.026
	(0.32)	(0.25)	(0.25)	(0.94)	(0.46)	(0.79)
Monthly per-capita expenditure in 100s of Rs	-0.010	0.044	0.001	0.056	0.038	0.064
	(0.52)	(0.03)	(0.94)	(0.00)	(0.01)	(0.00)
Scheduled caste or schedule tribe [0,1]	-0.139	-0.167	-0.037	-0.085	-0.010	0.044
	(0.02)	(0.01)	(0.60)	(0.25)	(0.88)	(0.64)
Female head of household [0,1]	-0.050	-0.032	0.042	-0.099	0.037	0.038
	(0.65)	(0.79)	(0.74)	(0.41)	(0.74)	(0.77)
No literate female adult ** [0,1]	-0.163	-0.430	-0.192	-0.448	-0.269	-0.535
	(0.02)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)
Primary schools per thousand	0.126	0.030				
	(0.21)	(0.01)				
Primary and upper primary schools per thousand			0.020	0.105		
			(0.36)	(0.00)		
Secondary schools per thousand					0.158	0.986
					(0.01)	(0.19)
Percentage of low quality primary schools	-1.574	-2.063	-0.312	-1.304		
	(0.00)	(0.00)	(0.54)	(0.01)		
Percentage of schools with no facility or kuchcha facility	-4.93	-2.982	-3.763	-2.299		
	(0.00)	(0.00)	(0.00)	(0.01)		

** For younger (6-14 years) and older (15-18) children, the adult is taken as over 15 years and over 18 years, respectively.

	Ages 6-10		Ages 11-14		Ages 15-18	
	Boys	Girls	Boys	Girls	Boys	Girls
Sample size	2422	2014	1847	1684	2071	1665
Log likelihood	-1402	-1187	-1097	-1013	-1168	-678

3. Time Invested in Education

The total time invested in education by each child (HK_i) is the sum of the time they spend in class (S_i) plus the time spent doing homework (H_i) plus travel time (T_i), to and from school – as equation (2) summarizes.

$$(2) \qquad HK_i = S_i + H_i + T_i$$

Generally speaking, it is not possible to attend school for ½ or ¾ hours each day – the normal school day is a "lump" of time. On any given day, some of the children who would normally be in school will be absent, due to illness, or competing work responsibilities, or because they want to skip school. We only observe S_i for those children who actually attend school on the day surveyed by ITUS, so the estimation of expected HK_i is a classic "sample selection bias" problem in the sense of Heckman (1979). Hence, we denote as λ_i the Inverse Mills Ratio derived from the probit estimation of equation (1) above and denote as X_i the variables influencing time allocation to schooling and to other time uses within the household. A general form of the estimating equation can then be summarized as in (3):

$$(2) \qquad E(HK_i) = f(p_i, q^*, F_i, X_{i,}, \lambda_i)$$

In other work (Motiram and Osberg, 2007) we have examined the 18.6% of households in rural India who have to spend time collecting water for daily use. For the development process, an important implication of carrying water is its possible impact on human capital acquisition – specifically, on the time that children will spend in school, travelling or doing homework. Rural women who spend an average of 47 minutes a day carrying water do not have that time available to spend attending to their children – unless perhaps they can delegate the task of fetching water to their teenage daughters,

which may be part of the reason their daughters withdraw from school. Even if children are not asked to carry water themselves, the fact that someone (usually the mother) has to spend time on this task means that children may be asked to perform other household chores – which implies that total household time spent in water collection may affect school attendance and human capital investment. Given that Table 4 shows the importance of adult female education for the school attendance of their children, this impact of water collection time on female investment in education can be expected to have implications over many future generations.

Table 5 reports "Heckit" estimates (i.e. Ordinary Least Squares estimates with the Inverse Mills Ratio calculated from the regressions reported in Table 4) of equation (2) for boys and girls for three age groups (6-10, 11-14 and 15-18).

A consistent implication of Table 5 is that public policy matters for human capital investment time. In all age groups, and for both genders, the amount of time a household has to spend collecting water for daily use is negatively correlated with the amount of time spent on the education of children. Public policy on water delivery therefore matters directly for the well-being of the women who would otherwise have to perform the daily drudgery of carrying water[xii], and indirectly for the future earnings and well-being of the children whose investment in education is lessened. Public policy on the availability and quality of schooling also has a clear impact. For both boys and girls, aged 6 to 10 and 11 to 14, the quality of school buildings is strongly significant and negatively associated with the human capital investment time of children. With the exception of girls 11 to 14, the local prevalence of large classes (PTR > 50) is similarly negatively correlated with time spent on education. Unfortunately, we do not as yet have quality measures for secondary schools that are comparable to those available for primary schools, so these variables do not appear for the 15-18 age group regressions – but for younger age groups, Table 5 is consistent with the hypothesis that families invest more of their children's time in education, in places where the quality of the local schools is better.

Another lesson of Table 5 is the non-homogeneity of impacts by level of education. Whether a child comes from a scheduled caste or scheduled tribe family is not statistically significant for time spent on early education (ages 6 to 10), but is statistically significant and negatively associated with time spent in later years (11 to 14 and 15 to 18) – for both boys and girls.

In the labour supply literature, a distinction is often drawn between the "extensive margin" of labour supply (when people who were not previously working get a job) and the "intensive margin" (when people who are already working decide to supply more or fewer work hours). The same terminology is useful here. Reading Tables 4 and 5 together, we have strong indications from Table 4 that the presence of literate females in the household is important for the "extensive margin" (i.e. for school attendance), but Table 5 indicates that, conditional on school attendance, this variable is not (except for girls 15 to 18) important at the "intensive margin" (i.e. in determining the amount of time spent *by students* on their schooling)[xiii].

Income (more exactly, Monthly per-capita expenditure) does not have a statistically significant association with either the probability of attendance or hours of time input for 6 to 10 year olds or 11 to 14 year old boys. For older children, and for girls 11 to 14, a positive and statistically significant coefficient at the intensive margin of attendance contrasts with a generally insignificant coefficient on hours studied, conditional on attendance. Similarly, the education of the head of household seems to matter more at the extensive margin of attendance than at the intensive margin of hours studied.

Most (i.e. 70%) children do attend school when aged 6 to 10, and there is no evidence for sample selection bias at those ages (i.e. the Inverse Mills Ratio is not significant) – but attendance falls for 11 to 14 year olds, when there is evidence for sample selection bias.

Table 5
Human Capital Investment Time of Rural Indian Children – ITUS 1999

(Probability > | *t* | in brackets)	Boys 6-10	Girls 6-10	Boys 11-14	Girls 11-14	Boys 15-18	Girls 15-18
Intercept	475.561 (0.00)	485.836 (0.00)	418.941 (0.00)	393.566 (0.00)	595.761 (0.00)	1314.736 (0.00)
Age	13.458 (0.00)	10.938 (0.00)	14.308 (0.00)	26.090 (0.00)	-11.361 (0.43)	-71.043 (0.06)
Married [0,1]					-17.491 (0.84)	-121.966 (0.08)
Household head has below primary education [0,1]	-8.697 (0.44)	0.729 (0.95)	-23.967 (0.02)	-20.982 (0.12)	6.934 (0.68)	27.441 (0.26)
Household head has primary education [0,1]	3.009 (0.72)	-22.874 (0.02)	0.459 (0.96)	-38.173 (0.01)	-32.117 (0.05)	4.903 (0.87)
Household head has middle education [0,1]	2.227 (0.80)	4.654 (0.63)	1.441 (0.90)	16.586 (0.13)	41.082 (0.02)	76.504 (0.08)
Household head has secondary education [0,1]	-17.36 (0.12)	-4.680 (0.69)	-20.829 (0.07)	-18.607 (0.18)	13.222 (0.42)	-60.935 (0.01)
Household head has higher secondary education [0,1]	32.208 (0.04)	30.821 (0.06)	22.338 (0.18)	9.814 (0.59)	4.423 (0.86)	75.894 (0.02)
Graduate [0,1]	-23.511 (0.25)	-14.949 (0.51)	-5.974 (0.79)	-1.914 (0.93)	-25.950 (0.35)	1.447 (0.97)
No literate Female Adult [0,1]	-2.549 (0.73)	-1.038 (0.94)	-10.834 (0.16)	22.793 (0.21)	-19.999 (0.23)	-129.990 (0.02)
Monthly per-capita expenditure in 100's of Rs.	-3.805 (0.00)	-4.735 (0.01)	-2.915 (0.04)	-11.544 (0.00)	3.388 (0.21)	7.213 (0.25)
Scheduled Caste or scheduled Tribe [0,1]	-8.656 (0.19)	-11.403 (0.13)	-15.888 (0.02)	-21.050 (0.01)	-33.368 (0.00)	-35.381 (0.03)
Primary Schools per thousand	2.495 (0.01)	3.498 (0.00)				
Primary and upper primary schools per thousand			12.511 (0.00)	3.696 (0.36)		
Secondary Schools per thousand					48.517 (0.00)	42.804 (0.01)
Percentage of low quality primary schools (PTR>50)	-151.394 (0.00)	-133.370 (0.05)	-179.065 (0.00)	-50.091 (0.43)		
Percentage of schools with no or kuchcha facility	-774.697 (0.00)	-849.170 (0.00)	-569.764 (0.00)	-616.905 (0.00)		
Number of females older than 15	-2.960 (0.05)	0.348 (0.84)	2.090 (0.31)	0.753 (0.72)	-1.127 (0.68)	-4.036 (0.28)
Time spent by household fetching water (minutes)	-0.352 (0.00)	-0.327 (0.00)	-0.27 (0.01)	-0.356 (0.00)	-0.512 (0.00)	-0.396 (0.02)
Inverse Mills Ratio	-86.515 (0.13)	-79.908 (0.144)	-95.245 (0.01)	-176.138 (0.01)	71.257 (0.33)	236.428 (0.09)
Sample Size	1694	1323	1219	934	677	347
Adjusted R^2	0.155	0.160	0.120	0.156	0.068	0.059

** For younger (6-14 years) and older (15-18) children, the adult is taken as over 15 years and over 18 years, respectively. All reported $HK_i > 660$ are recoded to 660.

4. Quantitative Implications

In rural India in 1999, over thirty percent of boys aged 11 to 14, and over forty percent of girls, did not attend school. Why do so many families in rural India not invest in the human capital of their children? How much is due to the barriers of caste? How much does the poor education of parents, which might produce ignorance of the benefits of education, actually matter? Could it be that low family income, and a consequent need for immediate earnings by children, is the largest explanatory factor? Or is the most quantitatively important explanation to be found in the low quality of education which is available?

Table 6 presents the quantitative implications, if the econometric estimates of the determinants of school attendance reported in Table 4 and the hours of investment estimates of Table 5 can be interpreted as causal. In Table 6, the four "thought experiments" simulated are:

(1) remove the influence of scheduled caste or tribe membership;
(2) assume that all heads of household have at least a high school education and all families have some literate female adults;
(3) assume that all families have incomes of Rs. 400[xiv] or more (i.e. all families with less income than the median for rural households are brought up to that level);
(4) increase the quality of local schooling to the level observed in Tamil Nadu in 2002, in those states which fall below Tamil Nadu.

In Table 6, the top panel reports actual outcomes (as measured in ITUS data). Each simulation case listed below that reports the difference between "no change" and simulated outcomes assuming the specified change. We report simulation results only for variables whose coefficient was significantly (at 5%) different from zero in Tables 4 and 5. In each simulation, some individuals' attributes do not change – e.g. we assume that simulation (1) only affects the children coming from Scheduled caste or tribe families, and that simulation (2) only affects the children coming from households with less than high school education of the head or female illiteracy.

For affected cases, each simulation proceeds in two steps. Using the results of Table 4, we first predict the expected value of the probability of school attendance of each individual whose attributes are assumed to change, with and without the change (e.g. in Simulation 1, with and without the influence of Scheduled Caste membership). To that expected value, we add a random draw from the error term implied in Table 4. We compare, for each individual, the calculated probability of school attendance with a random number drawn from a uniform distribution in order to assign that observation to school attendance, or not. The change in school attendance reported is the difference between a simulation which turns off, and another simulation turning on, the influence of the specific variable of interest (e.g. in Simulation I, the influence of SC/ST status).

For the population of affected individuals who are now simulated to attend school, the second step calculates the expected value of human capital investment time given their simulated attributes (including the influence of sample selection bias, as calculated using the simulated value of the individual's Inverse Mills Ratio) and adds a random error from the unexplained variance implied in Table 5 results. We then add together the actual outcomes of those individuals who were unaffected by the simulation and the simulated outcomes of the affected population and we compare that total with the simulated totals assuming no change in population characteristics.

We simulate the quantitative implications of our estimates in this way because we want to know the aggregate implications, across the distribution of actual characteristics of all people, of our econometric results – assuming the relationship is causal. In each "thought experiment", human capital investment can be expected to change at both the extensive margin (school attendance) and intensive margin (time input *of students*). Given the non-linear nature of probit estimates, changes can be expected to be dependent in a fairly complex way on the distribution of characteristics in the population. By design, we compare the implications of three quite dramatic 'thought experiments' about households (i.e. nobody has less than high school, incomes are all brought up to the median and caste distinctions are suddenly non-existent) with a more plausible possibility – that all other states are at least as good as Tamil Nadu in school quality. Tamil Nadu was chosen as comparator because it is a large state in our sample with good – but not the best – school quality. It therefore provides a "within sample" basis for estimates, and

represents an entirely plausible level of possible achievement of school quality for other states (see Table 1).

Table 6

Simulations of the Impact of SC/ST, Parental Education, Income and Poor Quality Schools*

	Ages 6-10		Ages 11-14		Ages 15-18	
	Boys	Girls	Boys	Girls	Boys	Girls
% Attendance	71.06	66.19	66.48	54.01	30.50	19.16
% Attendance for SC/ST	65.35	59.68	63.15	45.60	25.35	14.19
Median Human Capital Time*	440	435	480	490	525	510
Median Human Capital Time for SC/ST	440	420	475	465	500	475
Simulation I (SC/ST)						
Difference in % Attendance	2.32	2.60				
Difference in % Attendance for SC/ST	6.23	6.21				
Difference in Median Human Capital Time	5	6.28				
Difference in Median Human Capital Time for SC/ST	9.3	16.84				
Simulation II (Parental Education)						
Difference in % Attendance	5.03	9.84	13.68	13.57	10.36	17.74
Difference in Median Human Capital Time	0	-2.01	18.96	19.43	7.44	14.25
Simulation III (Income)						
Difference in % Attendance		0.84		0.45	-0.38	0.26
Difference in Median Human Capital Time		-4.91		-8.84	0	-1.52
Simulation IV (Quality)						
Difference in % Attendance	8.53	8.85	4.66	4.05		
Difference in Median Human Capital Time	55.87	53.25	36.54	40		

*We report only simulations involving statistically significant (at 5%) coefficients.

** All Medians calculated over positive values

In presenting Table 6, we are aware that we are comparing a plausible policy scenario (Tamil Nadu school quality) about changes to the supply of schooling with several arguably less plausible scenarios (e.g. no rural household having income less than the 1999 median) which might affect the demand by households for education. We do this, despite our belief that attenuation bias due to measurement error will mean we have probably *underestimated* the true association between school quality and schooling choices, because we want to emphasize our basic conclusion – that the influence of the

supply of poor school quality on the school attendance decisions of rural families in India dominates the influence of personal characteristics like scheduled caste membership or low household income.

Because most people are not members of Scheduled Castes or Scheduled Tribes, and most people are therefore not themselves affected by the marginalization of SC/ST members, there is not a large aggregate impact, for the population as a whole, when the stigma of membership in these groups is removed – e.g. for 6 to 10 year olds, an increase of 2.32 percentage points in the school attendance of boys, and 2.6 percentage points for girls. However, one should not think of the SC/ST issue just in terms of aggregate human capital formation and aggregate growth. If, for the same age group, one considers only members of scheduled castes and tribes, the change in attendance rates and median human capital investment time is clearly larger: 6.2 percentage points and +9.3 minutes for boys (+ 6.2 percentage points and + 16.8 minutes for girls).

Nevertheless, given the continuing political controversies surrounding the administrative mechanisms (such as reserved places) used to encourage the educational attainment of Scheduled Castes/Tribe and other disadvantaged children, it is perhaps interesting to note that the schooling of SC/ST children would also benefit from general improvements in school quality – which might be a policy choice with more widespread appeal. If there were no special treatment of SC/ST members, but the local school quality was improved to Tamil Nadu standards, the increase in school attendance of 6 to 10 year old SC/ST boys is simulated to be 4.1 percentage points (for girls 5.8 percentage points) – which would be a substantial fraction of the improvement to be expected from policy targeted on SC/ST members alone.

The results of our Simulation III – which increases the income of all below-median households to approximately the median monthly rural expenditure level – can be summarized as: “little, if any, impact – for a very large thought experiment”. The small size (where statistically significant) of the coefficient on income in Table 4 and 5 drives a strong conclusion – that inequality in schooling and human capital may play an important role in generating inequality in income, *but not the reverse*.

The major message of Table 6 is two-fold: [a] the importance of public policy in the supply of school quality for current educational choices and [b] the lagged impact of

past educational attainment of parents on the current educational choices they make for their children.

For the population as a whole, we estimate the impact of school quality improvements for 6 to 10 year olds to be + 8.5 percentage points in boys' school attendance and +8.9 percentage points for girls. As more students shift into the positive homework time zone, the median human capital investment time would also increase substantially. For the 11 to 14 age group, the school quality impact is tentatively estimated at +4.6 percentage points attendance for boys and + 4.1 points for girls, and about 40 minutes more of human capital investment time. We label these estimates as tentative because we hope to match our micro-data to more detailed district level data on a wider range of school quality indicators – which will enable modelling the outcomes associated with specific dimensions of school quality (something our simulation methodology is well equipped to do).

Our Simulation II represents an attempt to model the educational choices of rural Indian families, if they were already starting from the position of all having at least a high school education for the household head and had no problem of female illiteracy, but holding everything else constant. Were this the case, Table 6 shows large impacts – compared to current actual educational levels. For the 11 to 14 age group, we estimate that school attendance of both girls and boys would be roughly a fifth (13.6 percentage points) higher, *were all rural Indian household heads now high school graduates and were it the case that female illiteracy were not a problem*. The question, of course, is how to change the education of parents.

5. Conclusions

This paper has used state level data on the quality of schooling available in rural India, and the time use of Indian households, to come to an important (but tentative) conclusion – that more of the inequality in human capital investment time in rural India can be explained by the poor quality of schooling that is available to potential students than can be attributed to parental income or the barriers of scheduled caste and tribe membership.

We think this finding is important because a very large literature emphasizes the benefits of a more highly educated population. Many studies have concluded that more years of schooling produces higher individual earnings – Temple, for example, (2001: 484) concludes that in OECD nations: "the private rate of return to an additional year of schooling is typically between 5 and 15 percent". As well, health and social outcomes, such as the relationship between mother's education and the birth weight of babies in the UK (e.g. Chevalier and O'Sullivan, 2006) or the Height-for-Age of children (e.g. Handa, 1999b; Osberg et al, 2006) have been conclusively linked to education. Wolfe and Havemann have added up the value *to other people* of the changes in health, criminal activity, cognitive development of children, volunteer hours, etc., which are positively associated with increased education and conclude: "a conservative estimate of the value of non-labour market influences is of the same order of magnitude as estimates of the annual marketed, earnings-based of one more year of schooling" (2001:245). Adding together these externalities to others and the private impact of schooling on individual earnings, the aggregate social return to education is a crucial component of economic development.

However, we have to label our findings as "tentative" because we are, in this paper, relying on a match between state level measures of school quality and individual schooling decisions. The characteristics of the school system which are relevant to each individual household would ideally be measured at a more local level – but we do not, as yet, have the coding of districts in the ITUS data which would enable us to match district level school quality data with household schooling decisions. As well, the AISES survey data contains more detailed information on school characteristics (such as availability of desks or mats for students) which could potentially improve our measurement of school

quality. We hope to be able to incorporate such information in future work and thereby improve our results.

A second reason for tentativeness lies in the difficulties of proving causality. Angrist and Krueger (1999) remain a useful example of a large literature in labour economics which stresses the difficulties involved in unambiguous assertions of causality, in non-experimental social science settings. We are not reporting econometric estimates drawn from an environment (like the Progresa experiment in Mexico) in which we can say that the treatments of interest (e.g. school quality, parental education) were randomly assigned in the population. Our results are, strictly speaking, cross-sectional correlations using naturally occurring data which are *consistent with* the hypothesis that variables like local school quality play a causal role in family decisions about human capital investment, but we cannot reject the hypothesis that other explanations are also possible.

In future work, we plan to:

(1) examine the determinants of the time which Indian parents spend in direct instruction of their children and the gender allocation of that time;

(2) use quantile regression techniques to examine the heterogeneity in human capital investment behaviour, for families with similar measured attributes;

(3) extend our analysis to urban India.

We hope that this paper has served as a practical demonstration of the potential importance of time use data for analysis of development issues. Data on the market incomes and financial flows of households cannot reveal much about the behaviour of individuals who have little or no money income or expenditure (like children or many women or the very poor) – but everyone has 24 hours of time, every day, so the analysis of time use data can help increase understanding of the behaviour of many people whose outcomes are often ignored. And when important aspects of the development process (like human capital investment decisions or social capital formation or environmental degradation[xv]) largely occur outside the market economy, their main implications involve decisions about time allocation within households, so time use data is essential for their

quantitative analysis. Hence, a methodological implication of this paper is the importance of high quality time use data (like the ITUS) for development economics.

Substantively, our results underline the conclusion of Dreze and Sen (2002) on the important – indeed crucial – role of public policy in the human capital formation that is a prerequisite of sustained development. There is really no adequate substitute for good education – and the failure to provide universal access to high quality schooling is a major failure of collective choice in India.

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[i] The personal interview methodology was very labour intensive, but was considered necessary to collect reliable diary data from respondents who are, in some cases, illiterate. Gersuny (1998) discusses the advantages of the diary methodology, which walks the respondent sequentially through the previous day's activities, in improving recall and imposing aggregate consistency of responses. An "abnormal" day is defined in the "Instruction Manual for Field Staff" (1998: 23) as "that day of the week when guest arrives, any member of the household suddenly falls sick, any festival occurs, etc.". The "weekly variant" is "determined according to the pattern of the major earners holiday. If the major earner does not holiday, then school children's holiday will be taken. If even this is not applicable, then day of weekly hat (bazaar) may be taken".

[ii] This data, and detailed description of methodology, is available at http://www.7thsurvey.ncert.nic.in/

[iii] Writing in the context of the variation in supply of local public good in the suburbs of US cities, Tiebout (1956) argued that individuals could move between jurisdictions to satisfy their preferences for local public goods supply. If this model were applicable to the Indian context, local school system characteristics would be endogenous to local household preferences– but the central allocation of public school funding in India and the more limited mobility of Indian households makes this a poor assumption, in this context.

[iv] Although Duraisamy (2002) provides estimates of the rate of return to education in India between 1983 and 1994, and argues that the returns to female schooling in India typically exceed the rate of return for males, Heckman et al (2006) emphasize the complexities involved in providing an unambiguous estimate of "the" rate of return to years of education. Furthermore, Dreze and Sen (2002, especially Chapter 5) are representative of a large literature which emphasizes the huge variance in quality of schooling in India, and the low quality of much of the public school system.

[v] See, for example, Jantti et al (2006), Corak (2004, 2006), Blanden et al (2007), or Wilson et al (2007)

[vi] Furthermore, if the unmeasured dimensions of school quality are represented by *q'*, we know that only part of quality is measured – i.e. that $q = q^{**} + q'$. Because our measured variable q^{*} does not reflect either unmeasured aspects of school quality *q'* or district level variation *v,* our regression results will suffer from attenuation bias and understate the influence of school quality.

[vii] We measure "schools per 1,000 capita".

[viii] Kuchcha Building: School building, the walls and/or roof of which are made of material such as unburned bricks, bamboos, mud, grass, reeds, thatch, loosely backed stones is to be treated as kuchcha building. (from the AISES web site)

[ix] About 87% of children aged 6 to 18 are unmarried children of the household head. So, we use term "parent" for ease of exposition.

[x] Our caution is also partly due to the relatively small reported differentials in monthly expenditure for households with large differentials in land owned. The correlation between monthly per-capita expenditure and land ownership is also very low (0.16).

[xi] There is extensive literature on the Indian caste system and its implications for development. See Chatterjee (1993), Dirks (2001), Dumont (1970), Gupta (1993a,b), Gupta (2001), Dreze and Sen (2002) and Myrdal (1968).

[xii] See Motiram and Osberg (2007) for data on the gendered burden of water carrying, and the local determinants of piped water availability.

[xiii] Which implies that it would have been inappropriate to use a single equation Tobit specification for estimation of the determinants of HK_i.

[xiv] This is the median household monthly per-capita income for rural households.

[xv] Motiram and Osberg (2007) have used the ITUS to assess the relative importance of 'bridging' and 'bonding' Social Capital for public goods provision. In future work, we plan to link ITUS data to geo-coded data on deforestation (specifically, item 143. COLLECTION OF FUEL/FUEL WOOD/TWIGS).