

IMPACT OF CHILD LABOR ON SCHOOLING OUTCOME OF CHILDREN
LIVING IN RURAL PUNJAB, PAKISTAN

By

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Abstract

This paper analyzes the relationship between child labour and schooling outcome, measured by grade-for-age, of children living in rural Punjab. The endogeneity between child labour and schooling was controlled by the use of instrumental variables. Using Multiple Indicator Cluster Survey (MICS) 2007-2008, an inverted U-shaped relationship between the two was found, through the two stage least squares instrumental variable technique. The threshold level upto which a child can engage in labour without adversely affecting his studies was found out to be approximately 15 hours per week, implying that children living in rural Punjab can work for 15 hours per week without it affecting their grade attainment. Moreover, mother's education level has a significant positive impact on a child's grade attainment. This impact is more pronounced for girls than boys. Children having younger siblings and additional school going siblings will suffer in terms of grade attainment due to the added responsibility placed on them by their household. The results also suggest that the children belonging to relatively wealthier households are less likely to lag behind in terms of grade attainment.

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List of abbreviations

2SLS	Two Stage Least Squares
3SLS	Three Stage Least Squares
MICS	Multiple Indicator Cluster Survey
OLS	Ordinary Least Squares
IV	Instrumental Variable
GAGE	Grade-for-Age
SAGE	Schooling-for-Age
PSLM	Pakistan Social and Living Standard Measurement Survey
BISP	Benazir Income Support Programme

Introduction

Education plays an important role in human development and adds value to a civilized life. It results in the acceleration of economic and social growth. Unfortunately, Pakistan today, is crippled by low education levels, with a literacy rate of 58% and net enrollment rate in primary education (number of children aged 5 to 9 years attending primary level divided by the number of children aged 5 to 9 years) standing at 56% (PSLM survey, 2010-2011). Pakistan stands second¹ in the global ranking of out-of-school children, with 32.2% of children aged 5 years not enrolled in any school.

One of the major reasons for low education indicators may be child labor. According to the Child Labor Index 2012², Pakistan has ranked 9th in being 'extremely risky' in terms of its situation regarding child labor. According to a recent survey by the Federal Bureau of Statistics, 3.8 million (9.5%) children in the age group of five to 14 years were working, out of a total of 40 million children in the year 2011. As many as 45.7% of the entire population is living under the poverty line, deprived of the basic necessities of life like food, clothing, shelter and education.³The children belonging to these households are especially found to be out of school, due to the pressure of earning a living for their families. In recent years there has been a

¹according to the figures cited by the Pakistan Education Task Force 2011, <http://www.uis.unesco.org/Education/Documents/OOSCI%20Reports/pakistan-oosc-report-2013-en.pdf>

² conducted by the UK based company Maplecroft(http://maplecroft.com/about/news/child_labour_2012.html)

³according to a door-to-door survey carried out by Benazir Income Support Programme 2012 (BISP), http://www.sdpi.org/sdc/news_details.php?event_id=&news_id=655.

growing interest in the subject of child labor and its impact on education, especially in developing countries.

According to the World Development Report (1995), poverty and poverty-related factors are considered to be responsible for the high incidence of child labor in developing countries. The poverty hypothesis lays down the assumption that poor households cannot survive without the economic contribution of all members, including their children and therefore child labor becomes inevitable. Since these households do not have easy access to the credit market and are vulnerable to income shocks, their dependence on child labor earnings tends to be high. They view education as a luxury and are thereby reluctant to send their children to school. By keeping children out of school however, these parents perpetuate poverty into the next generations. Basu and Van (1998) concluded that poverty is the main cause of child labor and its eradication is possible only if poverty is eradicated. “Human capital formation through schooling and training is among the most important factors in the fight against poverty.”⁴ This strong correlation between child labor, poverty and human capital formations presents a trade-off, reflecting the cycle of poverty.

Poverty is also a reason behind children combining school with work. Spending long hours working can result in exhaustion thus preventing children from participating fully in school. Absence from school and reduced time for study can lead to lower learning achievement, thus representing a negative correlation between work and schooling. However, according to Phoumin (2008), “the most important issue is not whether the child works or not, but how many hours they are participating

⁴ Becker, 1993.

in labor.” His study found out that if a child works few hours in a day, it does not affect his schooling negatively, and may in fact have a positive impact on schooling in many cases, as it provides the income necessary for a household to allow the child to attend school, thus leading to human capital development. According to him, the negative impact of labor on a child’s schooling will only occur if the child works more than the threshold hours. This reflects the possibility that there may be an acceptable threshold of hours worked by a child in a week, beyond which school attendance and performance is negatively impacted.

The principal motivation of this study is, therefore, to find the level of weekly hours for which the children in Punjab can work, without it having a negative impact on their education. This paper thus examines, firstly the impact of work on children’s schooling outcome, i.e. grade attainment (child’s grade relative to his age) in school and secondly, establishes the threshold level of weekly hours. This research also indicates that a certain amount of work performed by children may not have an adverse impact on his or her schooling if the work is under the threshold level of hours, after which there is a negative relationship between work and child’s schooling outcome, reflecting an inverted U-shaped relationship. In order to analyze the trade-off, the study will examine the impact of child labor on a child’s grade attainment using Multiple Indicator Cluster Survey (MICS), for rural Punjab, carried out in 2007-2008. A number of other factors have also been accounted for while determining the trade-off, and are discussed below.

The study contributes to the existing literature by being the first one to examine the impact of work on a child’s schooling outcome and the threshold hours,

above which there is a tradeoff between work and schooling for children living in rural Punjab, Pakistan. The rest of the paper is organized as follows: section 2 discusses literature related to child labor and child schooling, section 3 presents the data and the basic descriptive statistics of important variables and section 4 discusses the methodology adopted to carry out the analysis, section 5 discusses the results of the regression as well as the diagnostic tests for the instrumental variables, section 6 concludes with the findings of the study and section 7 sheds light on the policy implications of the results of this study.

Literature Review

The definition of child labor provided by the International Labor Office (ILO), is “any activity other than study or playing, remunerated or unremunerated, that is carried out by a person under the age of 15 (14 in certain countries).” Researchers have tried to analyze the factors which have led to low school enrollment and consequently towards reduced human capital formation in developing countries. There is extensive literature highlighting the role of poverty in accounting for low school enrollment in developing countries. There is evidence of a strong tradeoff between child labor and school enrollment, due to poverty. Additionally, child characteristics, household characteristics such as household head education, dependency ratio and community infrastructure also impact school enrollment, hence influencing human capital accumulation of children.

i. Poverty and Child Labor:

There is broad consensus among researchers that a poverty-trap in developing nations leads to the prevalence of child labor, thus reducing school enrollment and human capital formation. Basu and Van (1998), Ray (2000), Kamga, among others, support the poverty trap argument as the reason that poor households tend to send their children to work rather than to school. Basu and Van (1998) have used empirical estimation techniques and have found child labor to be detrimental for education and accumulation of human capital of children. According to them, child labor prevails due to the presence of multiple equilibria in the labor market. They reach this conclusion through two axioms: the luxury axiom and the substitution axiom. The luxury axiom postulates that in household where the income from non-child labor is very low, child education is taken as a luxury good, so children have to work to reap economic gains for the family. This axiom along with the substitution axiom which states that child and adult labor are perfect substitutes, give rise to multiple equilibriums in the labor market; one, in which both children and adult work giving rise to a large labor supply and low wages and the second where only adults work, giving rise to low labor supply and high wage rate. An analysis of the data on Pakistan, by Ray (2000) and Bhalotra (2007) suggests that poverty has a strong positive impact on the working days of children.

ii. Trade-off between Child Labor and Schooling:

In addition to the human rights implications, child labor is considered undesirable due to its detrimental effect on child learning and human capital accumulation. A number of studies have provided evidence regarding the tradeoff

between child labor and schooling outcomes. Psacharopoulos (1997), Akabayashi and Psacharopoulos (1999), Ravallion and Wodon (1999), Ray (2000, 2001, 2003), Rosati and Rossi (2003), Ray and Lancaster (2004), Khanam and Ross (2005), Haile and Haile (2007), Ahmed and Ray (2011), all provide evidence on the trade-off between child labor and schooling. Psacharopoulos (1997) highlighted the impact of child labor on the educational attainment of children in school. He considers the work status of a child is the most important determinant of educational attainment as every hour spent at work, diminishes the time available for studying. The logit estimates of the regression found out that in Bolivia, the probability of a child failing a grade increases by nearly 10% if the child is working, and similarly for Venezuela, educational attainment is reduced by 2 years for a working child. Thus the trade-off was established and the negative relationship between child labor and school attainment was confirmed. This negative correlation between child labor and school learning was also highlighted by Akabayashi and Psacharopoulos (1999), who observed on a Tanzanian household survey, “that a trade-off between hours of work and study exists...hours or work are negatively correlated to reading and mathematical skills through the reduction of human capital investment activities.”

Ray and Lancaster (2004) investigated the impact of child labor hours on schooling outcome as a system of equations using the 3SLS method. He used data from Panama, Philippines, Sri Lanka, Namibia, Belize, Cambodia and Portugal and determined whether a relationship exists between child labor and schooling or not. He established a trade-off between child labor and schooling and concluded that children’s work adversely affects the school learning of a child as it leads to reduced

school attendance and the years of schooling attained by children, with the marginal impact weakening at the higher levels of work hours. Khanam and Ross (2005) and Ahmed and Ray (2011) used an IV estimation technique to see the impact of child labor on school attendance and school attainment, as well as the trade-off between the two for Bangladesh. They both used two dependant variables, school attendance and school/grade for age and instrumented child labor hours to reveal that work is negatively associated with a child's current school enrollment as well as his progress in school, as a working child will exhaust himself from long working hours and will prevent him from being attentive in school, deterring his academic performance. Similar methodology will be adopted in the current study to see if the results are consistent for Pakistan.

Ray (2000), in a comparative study on Pakistan and Peru, found that the trade-off between child labor and school enrollment was stronger in Pakistan than Peru, with the working child having a higher probability to miss out on school. The paper thus confirmed the proposition that "child's labor market participation presents the biggest obstacle to a child's school enrollment." Similar findings were presented by Ray (2001, 2003), in comparative studies using data from Pakistan and Nicaragua in the former and Nepal and Pakistan in the latter. In both studies, a clear trade-off between child labor and child schooling was established, with school attendance significantly declining as working hours rise, proving child labor to have a detrimental effect on schooling and hence human capital accumulation.

However, Fan (2004) concluded in his study that a small increase in child labor does not necessarily result in a trade-off with human capital investment and

Edmonds (2006) observed that the increase in financial resources of a household, due to child labor, can outweigh the negative impact of reduced time for study, thus implying that increased schooling does not necessarily translate into decline in child labor. This finding was reinforced by Phoumin (2007) in his study on Cambodia, which forms the basis of my study at hand. He used the Cambodian Child Labor Survey to investigate the trade-off between child labor and human capital formation and established a threshold level of hours, below which child labor lead to increase in human capital formation. Three measures of schooling outcome were used as dependant variables: SAGE (school attainment of a child relative to his age), years of schooling and child activities and were regressed on a number of explanatory variables which included child and household characteristics, aswell as the hours a child puts in labor. He used instruments of household assets to control for the endogeneity caused by child labor hours and the poverty status of a household. His results established an inverted U-shaped relationship between hours worked and schooling outcomes, with the threshold level approximating 22h per week. Phoumin's paper will be used as the basis for the study at hand, to determine the threshold level of hours for the working children in Punjab, Pakistan.

iii. Additional factors affecting the work-school trade-off:

While the trade-off between child labor and his schooling outcome has been established by a large number of researchers, there are also various studies that identify additional factors that can account for why a child's time in school might be substituted towards labor hours. Literature highlights the impact of parental education on the work-schooling trade-off. Ravallion and Wodon (1999) analyzed the impact of

an education subsidy in Bangladesh to see how a household's decision regarding their child's work or schooling changes. He found a strong effect of parental education on a child's work-schooling decision, with higher parental education leading to a higher incidence of school attendance rates and similarly in lowering the incidence of child labor, for both males and females. The findings of this paper is consistent with the finding of Ray and Lancaster (2004) that "better educated adults will, by ensuring that their children make more efficient use of the non labor time for study, will help to reduce damage done to the child's learning by her work hours." Similar results were found for rural Ethiopia, Thailand, Zambia, Mexico, Nepal, Peru, Zimbabwe and Indonesiaby Cockburn and College (2000) ,Tzannatos (2003), Canagarajah and Nielsen (1999), Bando et a. (2005), Ersado (2002), Ray (2000), Hsin (2005), Saucedo et al. (2004).

Apart from parental education, certain other factors, such as child and household characteristics have also been identified in literature, that are known to have a significant impact on child labor and schooling decision. Haile and Haile (2007) discover a possible gender bias in school attendance, with the males more likely to attend school than females, in rural Ethiopia. Also males are more likely to combine work with school, and this probability of combining work with school increases as household size increases. According to Rosati and Rossi (2003), having an additional child and the presence of pre-school aged children in a household leads to reduced school enrollment in both Pakistan and Nicaragua, this reduction being more pronounced for girls. Ravallion and Wodon (1999) find that in Bangladesh a higher number of working age adult males in a household reduces child labor for

boys, whereas if a household owns land and property, it would lead to a decrease in a female child labor but not for a male child. Moreover improved community infrastructure plays an important role in this decision and favors school enrollment over child labor, in Pakistan and Peru (Ray 2000).

Data

The empirical analysis is based on tehsil level data provided by the Punjab Multiple Indicator Cluster Survey (MICS), carried out by the Bureau of Statistics, Government of Punjab, Planning and Development Department. The latest survey from which the information is extracted was conducted in 2007-2008. This data is from the second round of the MICS and covers 91,280 households and 594,851 individuals across Punjab.

The Punjab MICS 2007-2008 is the largest survey conducted in the province and has been used to monitor the human and social development status prevailing in Punjab. This data is representative at provincial and district level with urban and rural breakdown. It provides a detailed breakdown of household's social and economic characteristics and contains information on Education, Employment and Household Assets/ Amenities, Health, Children and Women across households. It is the only data set that contains a separate module on child labor, for children aged 5 to 14 years in every household, thus making it the most suitable data set to conduct the study at hand.

The study also uses rainfall data for each tehsil in Punjab, which is provided by the Earth System Research Laboratory of the National Oceanic and Atmospheric

Administration⁵. The rainfall data is used to construct the instrumental variables, which will control for the endogeneity between child work and schooling in the regression model.

The sample chosen for the analysis includes children falling in the age bracket of 5-14 years, living in rural areas of Punjab. The reason for choosing this sample is, firstly, child is defined as an individual below the age of 14 years; secondly, usual school entry age in Pakistan is 5 years;⁶ and thirdly, ILO defines working children under the age of 14 years as child labor. Since the study analyses the impact of child labor on child schooling, the age bracket well suited for our analysis is 5 to 14 years. The analysis includes both paid and unpaid child labor performed for family and for someone who is not a member of the household, as well as household chores.

In the sample used in the analysis, 100,742 children living in rural Punjab fall in the age bracket of 5-14 years, which is 16.9 percent of the total surveyed population and is the sample of our analysis. Of this age bracket, 56,207(55.7%) are working (paid and unpaid) and 69,097 (68.5%) are attending school, irrespective of them being involved in either of the two activities. Males(55.5%) are more likely to attend school as compared to females (44.5%), depicting a gender bias in households. Out of the working population of children, on average, the mean number of hours worked by a child laborer is 18.5 hours in a week, with the males working 17.75hours in a week as compared to females who work for 19.25hours weekly.

The percentage of children, who are both attending school and are working is 37.2%(37,453) of the total children falling in the 5-14 yrs age bracket. Out of the

⁵ www.esrl.noaa.gov

⁶ <http://data.worldbank.org/indicator/SE.PRM.AGES>

sample of these children, males(55.6%) are more likely to combine work with school as compared to females (44.4%), and this incidence of combining work with school is the same in rural and urban areas of Punjab.

Mean age of working children, 9.75 years, is higher than those that are studying, 8.7 years. Also, the highest grade attained by the mother of a child, who is studying only, is greater, 3 years, than for a child who is working, 1.31 years, indicating that more educated mothers will encourage schooling only of their children (Tzannatos, 2003). Children who combine work with school have a slightly greater number of household members, 8.25, as compared to those who study only, 6, as there is more financial pressure, child labor is inevitable in such households.

Table 1: Summary Statistics for Full Sample

	Mean	Boys	Girls
Hours worked (hours)	18.5	17.75	19.25
Age (years)	9.25	9.3	9.2
Female Child	0.48	-	-
No. of babies	0.96	0.92	1
No. of children	3.27	3.21	3.3
No. of household members	8.25	8.2	8.3
Female child*no. of babies	0.481	-	1
Mothers education (yrs)	1.35	1.35	1.36
Deviations in rainfall	0.28	-	-
Wealthscore	-0.49	-	-

Source: Punjab MICS 2007-2008

Methodology

The study will use the empirical model on work-schooling trade-off, as adopted by Phoumin (2007). The model is derived from the conceptual framework that expresses the negative relationship between schooling and hours worked. The dependent variable of schooling outcome is measured by the age-adjusted school outcome variable – Grade-For-Age (GAGE), which measures the grade attainment of a child relative to his age. This dependent variable is regressed on a set of explanatory variables in the following regression model:

$$S_i = \beta_0 + \beta_1 H_i + \beta_2 H_i^2 + \beta_3 C h_i + \beta_4 W_i + \beta_5 X_i + U_{i1}$$

The present study models the schooling outcome S_i of the child with a set of explanatory variables: H_i represents the hours worked by children and its square (H_i^2) has been included to capture the marginal impact of child labor hours on schooling;; $C h_i$ represents child specific characteristics like gender of the child, education of mother; W_i represents the wealth score for each household, X_i represents household characteristics such as number of babies in the household (aged 0–4 years), number of children in the household (age 5–14 years), household size, and gender of household head.

The measure of schooling outcome is estimated using GAGE. GAGE is being used as the dependant variable, as according to Orazem and Gunnarsson (2004), it is essential to measure the educational attainment of a child relative to his age, if we are using a sample which has young children in it, that are still in school. Since our target sample includes young children aged 5-14 years, we will construct GAGE, to measure schooling outcome, as defined by Psacharopoulos and Yang (1991):

$$\text{GAGE} = [G / (A-E)] * 100$$

Where G is the highest grade attained by child i , A is the child age and E is the usual school entry age. A score of less than 100 indicates that the child is falling behind in his grade attainment as compared to other children of his age cohort, so he is having below normal progress in school. A score of above 100 means that the child is ahead of the grade assigned to his age and so is progressing above normal in his schooling. The regression model will be estimated by Tobit specification as the data for GAGE has more than 30 % zero values.

One mechanism through which Child Labor adversely affects schooling of a child is that longer working hours can exhaust a child and impacts his performance and learning in school. In our analysis, we will use the number of hours worked by a child in the last week, to see their impact on child learning. The hours worked by a child and its square has been included to determine the trade-off point between labor hours and a child's learning. According to the literature, work has a positive impact on child schooling initially since it helps to bring in the necessary income required to send a child to school, Thus, we will expect a positive relationship between child labor hours and schooling measure of GAGE. It is also assumed that there are a certain number of weekly hours worked by a child after which child's school attainment is adversely affected by his work. After estimating the regression, the first order condition, with respect to child labor hours, of the model will be used to establish this threshold level of hours, beyond which there is expected to be a negative relationship between hours worked and schooling. After taking the first

order condition of the model stated above, with respect to hours, we will get the hours worked threshold, which will be given by:

$$H_i = -\frac{\beta_1}{2\beta_2}$$

The effect of longer working hours will be captured by the variable of hours squared, which is expected to have a negative sign, reflecting an inverted U shaped relationship between work and schooling of a child, with schooling initially rising and then falling beyond the threshold level of hours.

According to Khanam and Ross (2005), “child work and school enrollment might be jointly determined outcomes of the child’s time allocation process,” in which case, endogeneity of child labor days could result in biased estimates. According to the existing literature, there are some factors such as motivation, which may impact child labor and schooling simultaneously. Therefore to control for endogeneity and to get unbiased results, this paper makes use of exogenous variations in rainfall within a particular tehsil, as an instrumental variable for hours worked by a child, as used by Beegle et al. (2008) and Boozer and Suri (2001). They argue that “rainfall shocks affect the agricultural production function and as such could have an effect on the use of child labor.” According to them, “plentiful rainfall could be a positive shock to productivity, and, depending on the agricultural production function, could increase the marginal productivity of child labor.” The use of variations in rainfall as an instrument therefore allows us to make a credible assertion regarding causality between the number of hours worked by the child and his schooling outcome as measured by GAGE. There are two channels that capture the effect of rainfall on child labor hours. In areas where a proper irrigation system is not in place, agriculture

depends largely on variations in rainfall. The need for labor and consequently child labor hours will rise, particularly in a situation of an increased harvest. Alternatively, for households relying primarily on agriculture, rainfall may affect income levels. If we accept rainfall as a valid proxy for income then it can be expected that with rising incomes, the number of hours worked by a child will go down. It is stipulated however, that the impact of rainfall on child labour hours as working through this channel would only be evident only after a lag and will therefore not be valid for the current estimation. The variation in rainfall will be taken as the deviation in rainfall in the year 2007-2008 from the last ten years average rainfall in a tehsil. The estimated sign of the first stage regression, in which child labor is regressed on the deviation in rainfall level in a tehsil along with other control variables, is therefore positive. If the rainfall level experienced a greater positive deviation from the mean rainfall in that tehsil in the last 10 years, the time spent by the child on the farm will go up due to greater labor requirement. This expected result is in accordance to the finding by Beegle et al. (2008) who find out a positive association between rainfall deviations and child labor, irrespective of the age and sex of the children. Furthermore, given rainfall is an exogenous factor, it is unlikely that rainfall will effect child schooling – the dependent variable – through any other channel. Thus, rainfall fulfills both conditions of valid instrument. Since the variable of hours worked is endogenous, so will be the variable of hours worked squared, which will be instrumented using the square of the deviations in rainfall.

In the MICS, the smallest identifiable geographical unit is tehsil; the survey contains information on 126 tehsils from 36 different districts. Therefore, the

instrumental variable will have variation at a tehsil level. In order to capture the effect of both the intensity and frequency of rainfall, we will consider how the rainfall in the period of January 2007 and April 2008 deviated from the average rainfall in a tehsil in the last ten years.

The paper employs the two-stage (2SLS) instrumental variable technique for the learning measure of GAGE to test the hypothesis whether time spent on work competes with a child's study hours, and so adversely impacts a child's grade attainment beyond a certain threshold of work hours.

Results

Table 2 shows the Ordinary Least Square and 2SLS results for the schooling outcome of GAGE. The OLS estimates differ in both signs and significance as compared to the 2SLS results. The OLS estimates, without controlling for the endogeneity of schooling outcome and child work, show that work can have adverse consequences for a child's schooling outcome, but this negative impact lessens as the child works for more hours. This result is contradictory to the hypothesis being tested in this study. If a child works while pursuing education then, his grade will be affected due to exhaustion from work. As these working hours are increased, the exhaustion and fatigue increases, further affecting a child's grade attainment negatively and might cause him to miss out on schooling completely, which is negated by the results of the OLS. A possible explanation for such results could be that a child probably is able to build an aptitude for work and is able to manage his time between school and work properly, so more work does not affect his grade attainment, hence the marginal impact of work on his learning will be weakened.

Table 2: Regression coefficient estimates of grade attainment relative to age: GAGE index

Variable	GAGE (OLS)	GAGE (2SLS)	GAGE (Tobit Marginal effects)
Child Characteristics			
Hours worked	-0.6060078*** (-28.63)	18.8061*** (22.01)	9.819843*** (22.01)
Hours worked squared	0.0090119*** (23.01)	-0.631925*** (-23.27)	-0.329967*** (-23.27)
Female child	3.895462*** (14.25)	-7.002333*** (-13.02)	-3.649384*** (-13.00)
Household Characteristics			
Female child * no. of babies	0.2794167 (1.48)	-0.5308834 (-1.38)	-0.2772074 (-1.38)
No. of babies (0-4yrs)	-5.526261*** (-37.14)	-12.9627*** (-39.47)	-6.768637*** (-39.47)
No. of children (5-14yrs)	-0.4585009*** (-5.21)	-1.200478*** (-6.75)	-0.6268444*** (-6.75)
No. of household members	0.5659306*** (11.67)	-1.741192 (-17.03)	-0.9091851 (-17.03)
Mother's education level	1.584284*** (11.90)	2.986569*** (10.29)	1.559474*** (10.29)
Household gender	2.045401** (3.84)	-4.454994 (-4.35)	-2.326231 (-4.35)
Wealthscore	13.98633*** (93.13)	24.36472*** (46.49)	12.72234*** (46.49)
Constant	32.2821*** (44.88)	-24.35375*** (-9.33)	-12.71662*** (-9.33)
R-squared (N=100662)	0.144	0.027	

First stage residuals (p values)	0.030.021
Overidentification Test (p values)	0.680.97

t/z statistics in parentheses , ***, **& * indicate significance at 1%, 5% and 10% respectively.

Therefore instrumental variables have been used to correct for such a bias, the result of 2SLS are also presented in Table 2. The proposition of this study that working hours of a child compete with his school hours beyond some threshold is confirmed by the significant and opposite signs of the 2SLS estimates of hours worked and hours worked squared. These results indicate that hours worked has an inverted U-shaped relationship with a child's schooling outcome of grade attainment relative to his age, with work having a positive impact on a child's grade attainment initially upto a certain threshold level of hours. The result is consistent with evidence from Cambodia(Phoumin, 2007) and Sri Lanka (Ray and Lancaster, 2004).

The turning point between hours worked and GAGE have been calculated by taking the first order condition of the regression model with respect to hours, as indicated in the empirical model. The trade-off point between the two is reached at 14.88 hours per week, implying that the children living in rural Punjab can work upto almost 15 hours per week or 2.13 hrs per day, without it having a negative impact on grade attainment. If a child spends approximately 2.13 hrs a day on work, be it on a farm or on household chores, he can do so without having to forgo schooling, which would have been the case had he spent longer hours on work. The positive sign for hours worked can be explained by the intuition that these few hours of work if paid might provide the household with the necessary income that he requires to continue his schooling, as it might be needed to pay his fees, thus keeping the child motivated

and having a positive impact on his schooling outcome. Another explanation may be that even if the hours worked are unpaid and include family and domestic work, then such type of work can be thought of as being important to instill a child with the essential training and skills that may not be acquired from somewhere else, and will help them in coping up with studies, time management and other personal skills thus contributing positively to the child's learning and schooling outcome. Working beyond this threshold level however, will lower his likelihood of remaining in the grade assigned to his age cohort and so he will lag behind children of his age.

Results show that the probability of falling behind in grade attainment is higher if the child is female. The significant and negative estimate of a female child shows that girls are less likely to be sent to school at the usual entry age of starting school or they are made to work at home with household chores and looking after their younger siblings, due to which they are unable to study in the grade that is assigned to their age-cohort and so they are falling behind in grade attainment. Similar results were found out for Pakistan by Rosati and Rossi (2003) in their study on Nicaragua and Pakistan. This impact is further reinforced by the tobit marginal estimates. It shows that females are more likely to lag behind in grade attainment, but the magnitude of the marginal estimates is smaller.

The signs of variables that control for household characteristics are as expected but with varying severity. The negative and statistically significant estimates of "number of babies (0-4 yrs)" and "number of children (4-15 yrs)" are consistent in all three regressions. This shows that the presence of babies in a household will mean more responsibility on the elder siblings to look after them and spend more time at

home, thus leading to a negative impact on a child's grade attainment. The marginal effects from tobit estimation show that the presence of babies in a household is associated with a decrease in the grade attainment of a child relative to his age. This result is consistent with the findings of Patrinos and Psacharopolous (1997) and Kruger and Berthelon (2007), who found out that in their studies that having younger siblings is associated with poorer school performance and increased work, including household chores. If a household has more children falling in the age bracket of 4-15 years, meaning more school-aged children, it is more likely that due to the budget constraint faced by that household, the children will be kept out of school and made to work to earn a living for their family members and to make school possible for themselves and their siblings. This will have a negative impact on their schooling outcome and thus children in the age bracket of 5-14 years are more likely to fall behind in grade attainment. This is consistent with the findings Maitra (2003), who also found out that the presence of three school going children (aged 6-17 yrs) in a household reduces a child's probability of school enrollment as compared to a child who has no siblings falling in this age group. Thus, additional same age children in a household reduces the probability of a child attaining his grade-for-age, as more school going children demands more resources to be made available to pay for their education, thus forcing children to miss out on school and to work and earn for both their and their siblings schooling. Household size, 'number of household members' has a negative but insignificant coefficient.

The estimate of mother's education level is significant and positive across all three regressions. The 2SLS estimates show that mothers education has a significant

impact on a child's grade attainment. It could be because educated mother's realize the importance of schooling for a child and so delay the decision to put their child to work. The awareness they possess due to education helps to secure their own and their child's future as educated children will contribute positively to the household's income stream. Therefore educated mothers are more likely to ensure that their child attends school over work and does not fall behind in grade relative to their age. Household head gender comes out to be insignificant implying that whether a household is headed by a male or female does not have an impact on the grade attainment of a child. The impact of mother's education continues to have a positive impact on the grade of a child, as shown by the marginal estimates, but the magnitude of this impact lessens with every added year of mothers' education.

As expected, the wealth score of a household comes out to be significant and positive across all three regressions. Wealthier households are less likely to engage in child labor, and more likely to ensure that their children attend school. A household with fewer financial constraints will have less reason to put their children to work and to pull them away from their studies. Thus children belonging to wealthier households will progress more in school as compared to children coming from poor households, which is further reinforced by the positive and significant marginal estimate.

Table 3 shows the first stage regression results for 2SLS. In the first stage, hours worked is regressed on all child and household characteristics along with the instrumental variables, deviations in rainfall over a tehsil and its square. It shows that both the IVs' are significant at 1% significance level. The expected positive sign of

the deviations in rainfall variable implies that positive deviations in rainfall over a tehsil will have a positive impact on the hours worked by a child. Positive deviations

Table 3: First stage results with Hours Worked as dependent variable

Variable	Hours Worked
Child Characteristics	
Female child	0.2833033*** (4.08)
Household Characteristics	
Female child * no. of babies	0.0658341 (1.37)
No. of babies (0-4yrs)	0.4346164*** (11.51)
No. of children (5-14yrs)	-0.1178738** (-5.28)
No. of household members	0.1108079*** (9.00)
Mother's education level	-0.396025 *** (-11.73)
Household gender	0.3214999 (2.37)
Deviations in Rainfall	0.5856777*** (22.89)
Deviations in Rainfall squared	-0.1276741*** (-12.93)
Wealthscore	-1.330257*** (-34.57)
Constant	4.349406*** (23.88)
R squared (N=100662)	0.0252

t statistics in parentheses, ***, **& * indicate significance at 1%, 5% and 10% respectively

from the average rainfall will mean positive shocks to the agriculture production function, requiring more labour at the farms, thus increasing the demand for child labour. This positive impact of deviations in rainfall lessens and starts to affect the hours worked of a child negatively, after some point, as reflected by the negative sign of the deviations in rainfall squared variable.

As a robustness check, separate regressions were run for boys and girls to see if the significance and signs of the variables are consistent across both genders and if the proposition of work time competing with school time beyond a certain threshold holds or not. Table 4 shows the tobit marginal analysis of GAGE for boys and girls. The results are somewhat consistent with those for the full sample. Hours worked maintains an inverted U shaped relationship with the schooling outcome of both boys and girls. The threshold level of hours comes out to be greater for boys than for girls, which is 16.24 hours and 13.22 hours respectively, implying that boys can work 3.02 hours more than girls, without their work negatively impacting their grade attainment..

The probability of grade attainment for a girl decreases due to the presence of babies (children aged 0-4 years) in a household, as shown by the significant and negative estimates of both “no. of babies (0-4 yrs)” and the interaction of the “female child” and “no. of babies” variable. This can be explained by the fact that in rural areas, elder siblings, especially girls are made to look after their younger siblings so their mother can take up other household chores. For boys too, presence of babies in a household affects their grade attainment negatively, but the effect is less severe as compared to that for females. Number of additional children aged 4-15 years in a

household decreases the probability of girls attaining the grade relative to their age,, but for boys it seems to have no impact as the variable of “no. of children (4-15 yrs)” comes out to be insignificant for them. Mother’s education level has a positive and significant impact on grade attainment of both boys and girls, but this impact is slightly greater for girls than boys. Educated mothers realize the importance of female education due to its impact on future generations, so they make sure that their daughters do not miss out on schooling, thus enabling girls to progress normally in

Table 4: Tobit Marginal effects of GAGE for boys and girls.

<u>Variable</u>	<u>GAGE</u>	
	<u>Boys</u>	<u>Girls</u>
Child Characteristics		
Hours worked	5.418077***	11.64311***
Hours worked squared	-0.166812***	-0.4403596***
Female child	-	-
Household Characteristics		
Female child * no. of babies	-	-6.424819***
No. of babies (0-4yrs)	-2.178452***	-3.326946 ***
No. of children (5-14yrs)	-0.6604513	-0.5039111***
No. of household members	-0.9779136	0.7771844
Mother’s education level	2.382704***	2.831655***
Household gender	-2.210953	-2.356959
Wealthscore	11.93667***	13.92628***
Constant	-2.124322***	-21.51295***
Overidentification Test (p value)	0.77	0.79

t statistics in parentheses, ***, **& * indicate significance at 1%, 5% and 10% respectively

school. As with the 2SLS estimates for the full sample, wealth score is both positive and significant for grade attainment of boys and girls living in rural Punjab, with the impact being more pronounced for girls. This implies that girls belonging to wealthier households are more likely to attend school rather than work and will progress normally at school to attain the grade assigned to their age cohort, as wealthier households put no responsibility on their girls, be it financial or looking after their chores, so they can attain education properly at school.

In order to test for instrument validity, Sargan test⁷ for over-identifying restrictions was employed by regressing residuals obtained, from the regression of GAGE on child labour and all other controls, on the instruments and all other exogenous variables. The null hypothesis, that excluded variables are exogenous cannot be rejected on the basis of the p values obtained (Table 3,4).

A final test was conducted to check whether the instruments are informative or not. Employing the F-statistic, the instruments of rainfall deviation come out to be significant at 1% significance level in all the first stage regressions thus concluding that it possess good explanatory power of a child's work hours and his grade attainment.

Conclusion

The objective of this paper was to study the impact of child labor on child schooling outcome in Punjab, Pakistan, using data from MICS 2007-2008. The main

⁷The Sargan test is a test of the validity of instrumental variables. The test checks whether the instrumental variables are uncorrelated to some set of residuals, and therefore if they are acceptable and valid instruments.(<http://economics.about.com/od/economicsglossary/g/sargantest.htm>)

proposition of this paper was that there is an inverted U-shaped relationship between child labour hours and his schooling outcome, measured by a his grade-for-age, and there is a certain threshold level of hours that a child living in Punjab can work, without it having a negative impact on his grade attainment. With the endogeneity between schooling and work of child being established, IV approach was employed to get unbiased results, with the deviations in rainfall over a tehsil and its square, as the instruments.

This study contributes to the existing literature by being the first one to determine the threshold level of hours for children living in rural Punjab. Results suggest that child labor has an inverted U-shaped relationship with a child's grade attainment, with the threshold level of hours standing at approximately 14.88 hours per week. This implies that a child living in rural Punjab will continue to progress normally and study in the grade assigned to his age cohort as long as he is working below 14.88 hrs a week. This finding of the paper reinforces the findings by Fan (2004) that "a small increase in child labor might not be a trade-off for human capital investment, because the positive impact of increased financial resources on education might outweigh the negative impact of reduced time for study". The average number of hours worked by a child living in rural Punjab is 18.5 hours per week, which is above the threshold level. Therefore for children to progress better in school and to attain the grade assigned to their age, their working hours must be lowered from 18.5 to 15 hours weekly. This threshold level of hours stays the same for boys and girls living in rural Punjab.

Girls are more likely to fall behind in grade attainment than boys, and households with more infant babies (aged 4-15 years) and additional school going children (aged 5-14 years) are more likely to have children who will lag behind in grade as considered to kids of their age. This is because older children will have to look after their younger siblings, resulting in less time allocated to study. This finding is in line with that of Kruger and Berthelon (2007), who concluded that “having younger sibling’s leads to less education and more work”. In cases where the household has additional school age children, children will have to work more to earn for their and their siblings education, resulting in less time allocated to study and hence will fall behind in grade attainment. Mother’s education is of utmost importance and significance for a child’s grade attainment. The more educated a mother is, the more will be the likelihood that the child will be sent to school instead of work, and he will progress normally according to his age. Wealthier households in rural Punjab will have better educated children as the children’s are not burdened with any paid or domestic work, so they tend to do well in school and grade attainment.

Policy and research implications

In light of the results obtained, it can be concluded that about two hours a day spent working may not adversely affect schooling outcomes for children living in rural Punjab. By engaging in some form of work for less than 15 hours a week, there could be a chance that the child is able to progress at school by providing the financial means to continue schooling and also gaining personal skills. Increasing the

hours worked by children beyond a threshold level is likely to adversely affect their studies, thereby having a negative impact on their schooling outcome. Now every child in Pakistan has a right to education by law. In implementing this policy, the findings on threshold level of hours estimated in this study can be useful for policy makers as a guide in making child labor laws that would suggest setting the limit on maximum child labor hours as below 15 hrs per week for children living in rural Punjab. Threshold level of hours can also be useful for the parents of children who have no other option but to put their child to work to generate finances for the household, but also want their child to get an education. Once parents know the turning point between child work and schooling, they can try to set a limit to their children's work activities so that it does not disrupt their progress in school.

For further research, the hypothesis of the amount of paid and unpaid child work inside and outside the house and its effect on schooling could be tested further based on these results. Specifically, gender and age effects as well as community influences on these results would be of interest. The wide variation in age at various levels of schooling is also related to child work and further research could study grade attainment using different age ranges to reflect late school entry in rural areas and flexibility in school progression. It would also be important to identify types of activity that may be dangerous or harmful to children's health, so that despite the number of hours worked some activities may have detrimental long term effects on health.

Another finding of this study that can have important policy implications is that an increase in the education level of mothers can significantly impact a child's

schooling outcome. Specific policy initiatives could be taken by the Punjab Government to increase female education and awareness, as it can help in increasing a women's bargaining power and consequently have a positive impact on reducing children's work and improving their education attainment. Educated mothers can have a greater role in household decisions and may be in a better position to secure more resources for her children's education. Thus, educating girls can have ripple effects across generations and can help fight poverty, and in so doing will help in reducing child labour.

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