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Child Labor and Learning Achievements: The Impact of Children's Work on School Performance

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Abstract

This study describes the tradeoff between hours spent on work and achievements at school by evaluating the impact of the duration of time spent on working each week on the school results of students that work in addition to attending secular school. The study analyzed data collected from a field survey conducted in four provinces of Pakistan. Using an education production function, the study finds that the relationship between working hours and school achievements is strictly negative rather than quadratic (inverted U) for a child engaged in work along with attending secular school. Furthermore, the study finds no evidence for the hypothesis that light work along with attending school will not affect the child's academic performance.

Keywords: Childhood activities, Human capital formation, Schooling, Education in Pakistan

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INTRODUCTION

Child labor has received much attention by researchers and international institutions over recent decades, in an effort to sensitize public opinion to eliminate this economically and socially un-desirable childhood activity. However, children across the world, particularly in developing countries, are currently engaged in a large number of activities classified as child labor.

These activities range from fairly harmless activities such as assistance at home and working in other's homes, to physically dangerous and morally repugnant tasks including soldiering and prostitution, Cigno and Rosati, (2009) In the middle of these extremes lies the bulk of what is generally termed economic activity. The ILO estimates that 306 million children worldwide between the ages of 5-17 were economically active in 2008, representing 19.3 percent, around one-fifth, of the world's children.

A comparison of the number of employed children broken-down by gender and age group is shown in the Table 1. Comparisons based on gender indicate that 21.4 percent of the world's total population of boys, and 17 percent of girls are engaged in child employment. Child labor is economically and socially undesirable for many reasons. Among them, two are basic: first, working at an early age is a violation of fundamental human rights. Second, working rather than receiving an education at an early age, is a disinvestment in human capital formation that is likely to damage future income prospects, Psacharopoulos, (1997)

The cited literature and discussion of the determinants of child labor in this study prompt the conclusion that child labor results due to socio-economic factors related to the child, household and community. These findings are consistent with those presented by Cigno and Rosati, (2009) that any form of child labor is a part and parcel of the general problems of underdevelopment. Therefore, does this mean that it can only disappear when the problem of underdevelopment is solved? They argue that patient policy intervention on a number of fronts, guided by a good understanding of theory and supported by sound empirical evidence, can substantially reduce child labor ahead of the other features of underdevelopment.

Moreover, after reviewing existing literature on the issue of child labor and education, one can suggest that a reduction in child

labor will enhance economic development if it is replaced by education the debate whether economic development reduces child labor or alternatively if the elimination of child labor enhances economic growth, is beyond the scope of this chapter.

To study the tradeoff between child education and its impact on child productivity, childhood activities can be divided into the following four categories. First, attending school and not working; second, attending school and working; third, neither attending school nor working; and fourth, working and not attending any school for education.

To analyze the tradeoff between child labor and achievements in school, one can focus on the second category: children who attend school and also work. The precise worldwide numbers of these children have not been reported yet due to some complications as reported by (Edmond, 2007; Assaad et al., 2010). This study found that around nine percent (215 out of 2496) of the children who attend school are also engaged in some form of regular work, either in their own businesses or the child labor market.

As there are a finite number of hours in the day, time spent on working is necessarily a trade-off with the time available for other childhood activities such as playing, resting, studying after school, and attending school. Moreover, working and attending school may also divert the attention of a child from normal study.

On this issue of working in along with attending school, Admassie, (2000) states that part-time child workers usually work before and after school, posing a potential hazard to their normal development as long working hours are likely to leave these children exhausted. Binder and Scrogin, (1999) found that if children identified themselves having engaged in market work during the previous day, they devoted an average of half hour less to combined school plus home study. Heady, (2003) also reported that working children in Ghana spend an average of one hour per week less in school.

On the determinates of child labor, after analyzing two data sets from Peru and Pakistan Ray, (2000b) found a positive association between the hours of child labor and poverty, and a negative association between child schooling and poverty in the case of Pakistani data, but not in the Peruvian data. He also found that the reduction in poverty rates, due to income from child labor, is greater in Pakistan than in Peru. Furthermore, he notes that both data sets agree on the positive role that increasing opportunities for adult education can play in improving child welfare.

These studies show that child work serves variously in generating income or saving family income, increase the current level of consumption in the household, or in some cases providing income that the whole family is dependent upon, rendering the child's labor unavoidable.

However, child labor rather than education decreases the prospect of future higher income for a child in adulthood. Thus, there are trade-offs between the current and future consumption of the household and child, with the possibility that the increase in family consumption owing to the child's work has positive effects on the child's future health and earning capacity.

Hence, the trade-off between the present consumption of the family and the future consumption of the child may be as great as one imagines? In other words, under some circumstances the working and schooling activities of the child perhaps, result in the family being better off than if the child was either only schooling or only working.

Previous studies on the issue of child labor reflect that the tradeoff between child labor and child schooling have received much attention. According to Psacharopoulos, (1997) in the context of Latin America, repeating a grade is a common phenomenon closely associated with children who attend school and work. He also found that the grade repetition reduces a child's educational attainment by about two years, relative to the control group of children who only attended school.

Similarly, in Ghana, Ray, (2003) suggested that an extra hour spent on wage-based market activities leads to a child losing out on 0.26 of a year's schooling, and a child who is currently attending school works 6.42

hours less per week than one who is not currently attending a formal school.

However, studies also exist where one finds a lack of consensus, with others presenting contradictory findings on the issue of the tradeoff between schooling and child labor. In one such study, Ruhm, (1997) concludes that there is currently no consensus as to whether student employment improves or worsens performance in high school. He also suggests that student employment increases the net investments in human capital, particularly for females and towards the end of high school.

Similarly, Turner, (1994) showed that working a moderate number of hours is positively related to high school performance. However, these studies are subject to the difficulty of adequately controlling for the potential selectivity of hours worked. Oettinger, (1999) found both small and large effects of average and extensive school year employment on children's educational productivity, respectively. He also suggested that summer employment did not affect children's grades, noting that school year employment affects grades by "crowding out" study time.

When Ray and Lancaster, (2005) analyzed multi-country data to discover the impact of children's work on schooling, they found that working even in limited amounts adversely affects a child's learning. They also discovered a significant exception in the case of Sri Lanka, which stood alone in providing evidence that children between the ages of 12-14 years can combine work and schooling without their school performance suffer. They further argue that the results from the Sri Lankan data indicate that a child in this age group can work up to 12-15 hours per week without suffering a loss in school attendance or adding to the length of their schooling.

There is also a lack of consensus regarding the effect of working during college on educational performance. Hood et al., (1992) found that grade point averages are highest among students with a moderate amount of work. Ehrenberg and Sherman, (1987) discovered a positive effect in working in on-campus jobs, but adverse effects resulting from off-campus jobs. Stinebrickner and Stinebrickner, (2003) found an additional hour of work to have large and statistically negative impact on a student's grades. They also concluded that by increasing one hour increase in a student's weekly work lowers their semester grade point average by 0.162.

The creation of this study is motivated by two factors. First, existing literature on this particular issue highlights a dearth of consensus on the nature of the tradeoff between working while attending school and a child's educational productivity. Second, under certain conditions, the ILO [Convention 138, Art. 7(b)] allows light work along with schooling. Therefore, from a policy point of view, it becomes important to have country-specific knowledge of the impact of the number of hours worked on the school achievements of a child. Moreover, it is also important to gauge whether working whilst attending school causes any real damage to the human capital formation of a child.

The study now arrives at some important questions from a research point of view: can the amount of work in terms of hours per day/week that a child might perform without negative repercussions be pinpointed, so that one can definitively say that above this limit, working along with attending school would negatively affect a child's achievements at school? Secondly, does any type of work carry the potential consequence of early dropout from school?

After all, working students might perform poorly in school, forcing them to repeat classes, and such apparent poor performance might result in the family thinking that their children should invest more time in work rather than school. The result may ultimately be the early dropout or removal from school and the continuation of child labor.

Based on the above available information and the current knowledge gap, the following chapter of this study aims to discover:

First, how child labor affects children's achievements at school when they work during their schooling?

Second, what is the minimum number of hours that children can safely work per week, beyond which their school performance is affected?

The hypothesis is that light work along with attending school will not affect a child's educational performance. The contradictory notion is that devoting more time to work reduces the amount of time that a child has available for study. It is expected that the amount of time that a child spends working may not necessarily affect their achievements up to a certain number of hours, whereas excessive work does. That is, time spent on work could have a quadratic relationship with the measurable achievements of a child in school. Further investigation will aim at finding the optimal amount of time for children to work while attending school.

In previous studies, many authors including Gunnarsson et al., (2006) Ray and Lancaster, (2004); Psacharopoulos, (1997); Heady, (2003); Akabayashi and Psacharopoulos, (1999); Bezerra et al., (2009) have examined the effect of child work on student performance by using standardized test scores, child attendance rates, years of school completion, etc., as a proxy for child achievement.

One is compelled to adopt this methodology due to the unavailability of information on the annual results of students who work and attend school. Stinebrickner and Stinebrickner, (2003) used grade point average as measure of human capital formation. However, their study analyzes the nature of the trade-off between working and student achievement in an older age group, namely college students.

Their study provides information on the number of daily/weekly hours a student spent on their own business on the work in the labor market, as well as the record of their performance in terms of grade point average. This will help surmise if a student's performance might be affected differently by work conducted on their own businesses, as compared to work in the labor market.

This study contributes to the growing literature regarding the cost of child labor on human capital accumulation in three different ways. First, in the context of Pakistan, one can consider the nature of the impact of children's work on school achievements, which may also be applicable to other developing countries. Second, in order to give more weight to the substantial hours worked, this study searches for a quadratic relationship between the hours of work and a child's academic achievement. If such a relationship exists, what are the optimal numbers of working hours per week above which a child's academic performance begins to decline? Most literature on the trade-off between child labor and schooling focuses on the child labor participation rates and school attendance.

The welfare costs that child labor may entail on human capital accumulation could be presented in a more realistic setting, if information regarding the hours of daily/weekly work during an academic session were available for each student, along with their annual school results for that academic session. Unique data containing this type of information was therefore collected for this study, representing the third contribution of this work.

The study proceeds as follows: section two discusses the model used for this study. Section three presents results and discusses the policy implications of the analysis, and the final section provides a conclusion.

Data and Important Descriptive Statistics

This study relies on a household survey collected in the months of September to December 2009, containing information on children engaged in child labor while going to secular school. In 189 of 963 households, children were found engaged in work along with attending school. However, of 546 children in 189 households, 215 worked while along with going to school.

The child's achievements in school are specified as a function of child, household and community characteristics. The list of the variables and the descriptive statistics are shown in Table 2. Variables such as working in the labor market as waged child labor and working at their own home or businesses as non-waged child labor may influence the academic achievements of the child. Recognizing this possibility, a variable of waged and non-waged child labor was included in the questionnaire in order to assess whether it makes any marked difference in the annual result of a child who is working while going to school.

As this variable also provided non-significant results in the econometric model and high values of AIC and BIC, it has been dropped from the list of important variables. A possible explanation for the non-significant result might be that for the child who works in addition to attending school, their performance in school is negatively affected. These results are not in accordance with the findings of Goulart and Bedi, (2008) where they found that economic work hinders educational successes while domestic work does not appear to be harmful, in the context of Portugal. The type of school attended by the child (public/private) was found here to have an effect on the children's annual result, and thus this variable is included in the model.

Analytical Approach

An education production function is used to measure the human capital formation in children who are working and attending school. The Education production function used here is similar in form to those used in previous studies, including (Hanushek 1979); (Lau 1979); (Knight and Sabot 1987); (Goulart and Bedi 2008).

Here, the purpose is to examine how work affects the academic performance of a child who is working while attending school. The education production function can be written as:

$$A_i = f(t_w, Z) \quad (1)$$

Where:

A_i = achievements at school.

t_w = daily time spent on work.

Z = daily time spent on other household and childhood activities.

To give more weight to the substantial hours worked by the students, the square of the work hour is added to the education production function. It is assumed that the time spent on work could have a quadratic relation with achievements. Moreover, it is expected that time spent on work may not necessarily affect achievements up to a certain level, while excessive work does.

$$A_i = \alpha + \beta_{1i} t_w + \beta_{2i} t_w^2 + \gamma_i z + u_i \quad (2)$$

The inclusion of working hours (t_w) and its square (t_w^2) is designed to notice whether the effect of working hours on school achievements (A_i) changes direction beyond a certain critical value of working hours, denoted by (t_w^*) . This possibility exists: if the estimations are observed, both β_1 and β_2 are statistically significant and have opposite signs. In this case, the critical value of child working hour can be calculated by:

$$t_w^* = -\frac{\beta_1}{2\beta_2} \quad (3)$$

For this purpose, the last year's annual result of a child (who is working and attending school) is treated as a function of: daily time spent on any type of regular work during the academic year, the class in which student is enrolled, the public or private status of the child's school, and the number of years of formal education completed by the child's mother. Selection of the variables is based on the hypothesis discussed in the relevant studies, and in comparison to post estimations AIC (Akaike Information Criterion) and BIC (Bayesian Information Criterion) values for alternative models. Thus, the education production function is as follows:

$$res = \beta_0 + t_{w_i}\beta_1 + \beta_2 t_w^2 + level_i\beta_3 + schp_i\beta_4 + ordch_i\beta_5 + medu\beta_6 + com\beta_7 + u_i \quad (4)$$

Where:

res = annual results of the student working and going to school.

(t_w) = time spent on working, in hours worked per week.

(t_w^2) = the square of the time spent working, in hours worked per week.

level = level of the student who is working and going to school.

schp = a dummy variable indicating the school of the child, taking value of 1 when the child is studying in public school and 0 otherwise.

ordch = order of the child in the siblings

medu = years of school education successfully completed by the mother of the child

com = community variables including distance from nearest girls and boys schools

It is assumed that normally distributed error terms allow the estimation of the equation 4 using the OLS method. It is also possible that the unobserved factors that determine the annual result of a student who is working and going to school and the independent variables are not correlated. In case that they are correlated, the model will suffer from the problem of endogeneity, with a biased estimate.

Furthermore, Tyler., 2003; suggests that the endogeneity of the labor supply decision of high school students will result in underestimates of the negative impact of school-year work on academic achievement. To remove this potential bias, the Hausman Test is used to determine whether or not the explanatory variables in the model suffer from endogeneity. It is suspected that the number of working hours per week of a child who is working and going to school (t_{wi}) and the mother's successful years of formal education (*medu*) suffer from the problem of endogeneity.

The father's perception of school education, the school of the child and the household's state of poverty are chosen as potential instrumental variables. It is assumed that these variables do not affect the child's annual results. However, an increase in the father's number of years of formal education might result in a decrease in the working hours of a child who works and attends school, and therefore might be good predictors of the child's weekly working hours. The state of poverty of each household is measured by using its monthly expenditure on electricity.

It is also assumed that the household's expenditure on the consumption of electricity has an inverse relationship with the working hours of a child. Moreover, poorer households spend less on electricity, and the children who belong to poor households work for comparatively more hours. The data also provides information on the head of household's perception of the impact of school education on the productivity of a child, which is used as a potential instrumental variable of the mother's education.

It is also worth mentioning that during the process of selecting instrumental variables, it became known that the type of school attended by the child (public or private) could be used as an instrumental variable. Though it will be a weak instrument, the annual results of children who work while attending school are somewhat affected by the type of school that the child attends. That is why this variable is included in the main structural equation, instead of the reduced form equation at the beginning.

The final decision regarding the inclusion or exclusion of this variable follows the results of the Hausman specification test for endogeneity. However, the tests for endogeneity reveal an interesting detail: children who work while attending public school work more hours than children who are educated in private schools.

To determine whether the assumptions that a household's state of poverty and a child's attendance of public school are potential instruments a reduced form equation was run (5 and 6 respectively) with weekly working hours (t_{wi}) and the mother's years of formal education (*medu*) as the dependent variables, separately from all exogenous variables including the instruments and the explanatory variables.

$$t_{w_i} = \pi_0 + t_{wi}^2\pi_1 + level_i\pi_2 + medu_i\pi_3 + schp_i\pi_4 + ordch_i\pi_5 + ln\_pcexpel_i\pi_6 + com_i\pi_7 + v_i \quad (5)$$

and:

$$medu = \delta_0 + t_{w_i}\delta_1 + t_{wi}^2\delta_2 + level_i\delta_3 + edufinc_i\delta_4 + ordch_i\delta_5 + schp_i\delta_6 + com_i\delta_7 + \epsilon_i \quad (6)$$

Where:

ln_pcexpel = monthly per-capita expenditure on electricity in the household in log form, and

edufinc = a categorical variable measuring the father's perception of the impact of school education on the future productivity, 1 = disagree , 2 = ambivalent, and 3 = agree.

Following the procedure of the Hausman Test, the residuals of the reduced form equations are taken back into the two structural equations, in order to test the statistical significance of the coefficients on the residuals in both structural equations.

Residuals of the reduced form (equation 5) for the working hours per week for a child who works while attending school (t_w) are given as:

$$v_i = t_{w_i} - (\pi_0 + t_{wi}^2\pi_1 + level_i\pi_2 + medu_i\pi_3 + schp_i\pi_4 + ordch_i\pi_5 + \ln\_pcexel_i\pi_6 + com_i\pi_7) \quad (7)$$

The residuals of equation 7 were tested for the endogeneity of the variable "working hours of the child who works while attending school" (t_w) in the following structural equation:

$$res_A = \beta_0 + t_{w_i}\beta_1 + t_{wi}^2\beta_2 + level_i\beta_3 + medu_i\beta_4 + ordch_i\beta_5 + schp_i\beta_6 + com_i\beta_7 + v_i\gamma_1 + u_i \quad (8)$$

The results of the structural equation 8 indicate that the hypothesis that (t_w) is endogenous and needs instrumental variables cannot be rejected. For the detailed results see table 3.

The same Hausman Test procedure was performed, in order to check whether the mother's year of successful formal education (*medu*) is endogenous. It appears that the perception variable (*edufinc*) could be used as a potential instrumental variable in the reduced form equation, with (*medu*) as the independent variable (Residuals of the reduced form (equation 6) are given as:

$$\varepsilon_i = medu_i - (t_{w_i}\delta_1 + t_{wi}^2\delta_2 + level_i\delta_3 + edufinc_i\delta_4) \quad (9)$$

The residuals of the equation 8 were tested for the endogeneity of the variable "mother's years of successful formal education" () in the structural equation given below:

$$res_B = \beta_\circ + t_{w_i}\beta_1 + t_{wi}^2\beta_2 + level_i\beta_3 + medu_i\beta_4 + com_i\beta_5 + \varepsilon_i\gamma_1 + u_i \quad (10)$$

Based on the results of equation 10, the hypothesis of endogeneity was rejected, for the details of the test results see table 4.

After accepting the hypothesis for the endogeneity of working hours of a child who works while attending school, two stage OLS is used in order to achieve un-biased estimators. The empirical strategy, used here to control for the correlation of working hours and unobserved factors, consists of two parts.

First, a set of instrumental variables related to the weekly working hours of a student are included in the educational production function. These are years of formal education successfully completed by father of the student, monthly expenditure on electricity in the household, and the school in which student is enrolled. These variables may be viewed as proxies to measure the poverty status in the household.

The first step regression results show that poor students work more. Second, after including these poverty control variables two-stage IV strategy is used in order to achieve un-biased estimators. The reduced form and structural equation for these two procedures is given as:

$$t_{w_i} = \beta_\circ + t_{wi}^2\beta_1 + level_i\beta_2 + medu\beta_3 + schp_i\beta_4 + expel_i\beta_5 + fedu_i\beta_6 + v_i \quad (11)$$

$$\gamma_i^{'} = t_{w_i} - (\beta_\circ + t_{wi}^2\hat{a}_1 + level_i\beta_2 + medu_i\beta_3 + schp_i\beta_4 + pexpel_i\beta_5 + fedu_i\beta_6) \quad (12)$$

$$res = \beta_\circ + t_{w_i}\beta_1 + t_{wi}^2\beta_2 + level_i\beta_2 + medu_i\beta_4 + schp_i\beta_5 + expel_i\hat{a}_6 + com_i\beta_7 + \gamma_i^{'}\delta + u_i \quad (13)$$

The structural equation 13 provides consistent estimates; however, in 2SLS standard errors are higher than the OLS. When deciding whether to use OLS or 2SLS, there is generally a trade-off. For example, OLS has smaller variance and estimates are efficient and in 2SLS the estimates are consistent with comparatively higher variances. In such a situation, the Hausman test can be used to check whether the differences between the two estimators are statistically significant, and which method provides appropriate results. It tests:

$H_\circ$: the efficient estimator (OLS) is consistent.

H_a : the efficient estimator is not consistent.

H° favors the use of OLS while Ha favors the use of 2SLS. The test results show the p-value of 0.0198. As there is one endogenous regressor handled by the 2SLS estimator, at one degree of freedom, H° is rejected. This favors 2SLS, indicating that the OLS estimates in this study will not be consistent.

RESULTS AND DISCUSSION

Estimates for the education production function of the child's activity of working and going to secular school are shown in Table 5, with the results differentiated into two parts. The first part presents the first-stage regression of weekly working hour's results the results of first-stage and IV (2SLS) regression, it is obvious that one cannot address the issue of a trade-off between hours worked and school achievements adequately without controlling for the potential problems of endogeneity. From the first-stage regression results for weekly working hours (Table 5), one can conclude that weekly working hours are affected by the state of poverty in the household, measured in this case by the monthly per-capita expenditure on electricity and the type of school in which the child is enrolled.

Prior studies on the issue of child labor and schooling reach the consensus that child labor is harmful for human capital formation, sees for example (Patrinos and Psacharopoulos 1995); (Basu, 1999); (Heady 2000); (Basu and Tzannatos 2002); (Rosati and Rossi 2003); (Ray and Lancaster 2004).

Consequently, in order to observe how substantial hours of work affect a child's achievements in school, or in other words the process of human capital formation, the square of the weekly working hours is included in the education production function. The study results for the education

production function (the Table 6) present that any substantial number of hours worked along with study are harmful for the child's school achievements. The results are confirming that the adverse effects will increase with the increase in the number of hours worked per week.

Furthermore, calculations for minimum working hours show that children's achievements begin to decline after working only 0.036 hours per week. These results indicate that any type of child labor hinders the achievement of a child in school if more than 0.036 of an hour is spent weekly on the work.

That is almost zero, and the study finds no evidence for the hypothesis that light work along with attending school will not affect the child's academic performance. Based on these results, one cannot suggest any optimal hours of work without expecting that a child's academic achievement will suffer. Among the household variables, this study finds that the number of years of formal education successfully completed by the mother has a positive role on the child's school performance.

The variable *level* is measuring the grade of the student. The study results also indicate that the performance of children who work while attending school is better in higher than lower grades. The variable 'order of the child in siblings' has no statistically significant effect on the child, however the first stage results show that older children work for longer hours as compared to the youngers.

One of the limitations of this study is that girls engaged in some irregular household chores could not be included because information for their hours of work was not available. This might not affect the final results of the study for two reasons. First, girls spend more time at home compared to boys, so they have more time for study if their housework is irregular, leaving adequate time to devote to their studies. Second, the majority of work given to girls is in their own home, thus the amount of time that might be spent traveling to and from work is reduced, potentially minimizing the overall time lost from their studies.

Tables:

Table 1: Worldwide Numbers of Children in Employment

	Total Population ('000)	Children in Employment ('000)	Activity Rate (%)
World	1,586,288	305,669	19.3
Boys	819,891	175,777	21.4
Girls	766,397	129,892	16.9
5-14	1,216,855	176,452	14.5
15-17	369,433	129,217	35.0

Source: Statistical Information and Monitoring Program on Child Labor (SIMPOC), ILO, 2010.

Table 2: Showing the Descriptive Statistics of the Variables Used For Analysis

Variable	Mean	Standard dev.	Min.	Max.
Annual results of the student (in percentage)	54.1	12.6	25	93
Time spent on working in a week (in hours)	23.3	7. 7	6	48
Level of the student in school	6.4	1.9	3	10
Years of formal education successfully complete by the mother of the child	0.3	1.0	0	6
School of the child, 1 when child is studying in public school and 0 if a private school	0.53	0.49	--	--
Years of formal education successfully complete by the father of the child	2.12	3.9	0	16
Order of the child in the siblings	3.74	1.80	1	9
Household monthly expenditures on electricity	2043.2	630.5	285	4030
Average distance from nearest primary, middle, and high school for boys	2.8	0.72	1	4.33
Average distance from nearest primary, middle, and high school for girls	2.71	0.79	1	4

Source: Survey Data 2009

Table 3: The procedure of the Hausman Test

```
. reg tw sq_tw level medu schp ln_hhexpel ordch avdisboys avdisgirls

      Source |       SS       df       MS              Number of obs =     215
-------------+------------------------------           F(  8,   206) = 2013.07
       Model |  16937.8988     8  2117.23735            Prob > F      =  0.0000
    Residual |  216.659302   206  1.05174419            R-squared     =  0.9874
-------------+------------------------------           Adj R-squared =  0.9869
       Total |  17154.5581   214  80.1614866            Root MSE      =  1.0255

------------------------------------------------------------------------------
          tw |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       sq_tw |    10.01561   .0942971   106.21   0.000     9.829696    10.20152
       level |    .0866356   .0399209     2.17   0.031     .0079297    .1653415
        medu |    .0219235   .0603531     0.36   0.717    -.0970654    .1409125
        schp |   -2.109624   .3434229    -6.14   0.000    -2.786698   -1.43255
  ln_hhexpel |   -1.128238   .1950076    -5.79   0.000    -1.512704   -.7437713
       ordch |    .1004385   .0440796     2.28   0.024     .0135334    .1873436
   avdisboys |    .0423232    .170958     0.25   0.805    -.2947286    .3793749
   avdisgirls |    .0590912   .1572711     0.38   0.708    -.2509762    .3691586
        _cons |   -14.87183   1.780524    -8.35   0.000    -18.38221   -11.36144
------------------------------------------------------------------------------

. test (schp=0)

 ( 1)  schp = 0

       F(  1,   206) =   37.74
            Prob > F =    0.0000

. test (ln_hhexpel=0)

 ( 1)  ln_hhexpel = 0

       F(  1,   206) =   33.47
            Prob > F =    0.0000

. predict resid, residuals
(331 missing values generated)

. reg ln_lyres tw sq_tw level medu ordch avdisboys avdisgirls resid

      Source |       SS       df       MS              Number of obs =     215
-------------+------------------------------           F(  8,   206) =   50.64
       Model |  7.74571339     8  .968214174            Prob > F      =  0.0000
    Residual |  3.93838171   206  .019118358            R-squared     =  0.6629
-------------+------------------------------           Adj R-squared =  0.6498
       Total |  11.6840951   214  .054598575            Root MSE      =  .13827

------------------------------------------------------------------------------
    ln_lyres |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          tw |   .0297469   .0154467     1.93   0.056    -.0007071    .0602008
       sq_tw |  -.4992943    .154645    -3.23   0.001    -.8041841   -.1944045
       level |   .0172707   .0057037     3.03   0.003     .0060257    .0285158
        medu |    .011898   .0080488     1.48   0.141    -.0039705    .0277666
       ordch |  -.0097595   .0062406    -1.56   0.119     -.022063    .0025441
   avdisboys |  -.0018513   .0230764    -0.08   0.936    -.0473475    .0436449
   avdisgirls |   -.008838   .0212166    -0.42   0.677    -.0506676    .0329915
       resid |  -.0361822   .0180788    -2.00   0.047    -.0718254   -.0005389
       _cons |   5.663993   .4064788    13.93   0.000     4.862601    6.465385
------------------------------------------------------------------------------
```

Table 4: The procedure of the Hausman

```
. reg medu tw sq_tw level schp edufinperc ordch avdisboys avdisgirls

      Source |       SS       df       MS              Number of obs =     215
-------------+------------------------------           F(  8,   206) =    6.89
       Model |  63.8270746     8  7.97838433            Prob > F      =  0.0000
    Residual |  238.656646   206  1.15852741            R-squared     =  0.2110
-------------+------------------------------           Adj R-squared =  0.1804
       Total |  302.483721   214  1.41347533            Root MSE      =  1.0763

------------------------------------------------------------------------------
        medu |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          tw |  -.0540611   .0681177    -0.79   0.428    -.1883582     .080236
       sq_tw |   .7312172   .7039266     1.04   0.300    -.6566069    2.119041
       level |   .0039211   .0428329     0.09   0.927    -.0805259    .0883681
       schp  |   -.675702    .387633    -1.74   0.083    -1.439939    .0885345
  edufinperc |   .6016789   .0894364     6.73   0.000     .4253507     .778007
       ordch |   .1286105   .0484573     2.65   0.009     .0330746    .2241463
    avdisboys |   .0616688   .1794064     0.34   0.731    -.2920394     .415377
   avdisgirls |  -.1228566   .1650487    -0.74   0.458    -.4482579    .2025447
        _cons |  -2.650072   1.843044    -1.44   0.152    -6.283719    .9835758
------------------------------------------------------------------------------

. test (edufinperc=0)

 ( 1)  edufinperc = 0

       F(  1,   206) =   45.26
            Prob > F =    0.0000

. predict resid, residuals
(331 missing values generated)

. reg ln_lyres tw sq_tw medu level ordch avdisboys avdisgirls resid

      Source |       SS       df       MS              Number of obs =     215
-------------+------------------------------           F(  8,   206) =   49.19
       Model |  7.6692114     8  .958651425            Prob > F      =  0.0000
    Residual |  4.01488371   206  .019489727           R-squared     =  0.6564
-------------+------------------------------           Adj R-squared =  0.6430
       Total |  11.6840951   214  .054598575           Root MSE      =  .13961

------------------------------------------------------------------------------
    ln_lyres |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
          tw |   .0032834   .0081432     0.40   0.687    -.0127714    .0193381
       sq_tw |  -.2349708   .0821051    -2.86   0.005    -.3968448   -.0730968
        medu |   .0142084   .0182733     0.78   0.438    -.0218182     .050235
       level |   .0206873   .0055682     3.72   0.000     .0097094    .0316653
       ordch |   -.006478   .0061123    -1.06   0.290    -.0185286    .0055727
    avdisboys |   .0004725   .0233218     0.02   0.984    -.0455074    .0464525
   avdisgirls |  -.0074002   .0214823    -0.34   0.731    -.0497536    .0349531
       resid |  -.0012672   .0203857    -0.06   0.950    -.0414586    .0389242
        _cons |   4.982481   .2259953    22.05   0.000     4.536921    5.428041
------------------------------------------------------------------------------
```

Table 5: The first-stage regression results for weekly working hours

```
First-stage regression of tw:

Statistics consistent for homoskedasticity only
Number of obs =                   215

------------------------------------------------------------------------------
          tw |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  ln_hhexpel |  -1.128238   .1950076    -5.79   0.000    -1.512704   -.7437713
      public |  -2.109624   .3434229    -6.14   0.000    -2.786698   -1.43255
       sq_tw |   10.01561   .0942971   106.21   0.000     9.829696    10.20152
        medu |   .0219235   .0603531     0.36   0.717    -.0970654    .1409125
       level |   .0866356   .0399209     2.17   0.031     .0079297    .1653415
       ordch |   .1004385   .0440796     2.28   0.024     .0135334    .1873436
    avdisboys |   .0423232    .170958     0.25   0.805    -.2947286    .3793749
   avdisgirls |   .0590912   .1572711     0.38   0.708    -.2509762    .3691586
        _cons |  -14.87183   1.780524    -8.35   0.000    -18.38221   -11.36144
------------------------------------------------------------------------------

F test of excluded instruments:
  F(  2,   206) =   38.09
  Prob > F      =   0.0000
Sanderson-Windmeijer multivariate F test of excluded instruments:
  F(  2,   206) =   38.09
  Prob > F      =   0.0000
```

Table 6: Regression Results of Annual Results of Children Work and Attending School

Variable	Coefficient
Time spent on working in a week, (in hours)	2.757***
	(0.788)
Square of the time spent working in a week, (in hours)	-38.748***
	(0.184)
Years of formal education successfully completed by the mother of the child	0.642
	(0.411)
Level of the student in the school	0.834**
	(0.291)
Order of the child in siblings	-0.448
	(0.319)
Average distance from nearest primary, middle, and high school for boys	-0.008
	(1.178)
Average distance from nearest primary, middle, and high school for girls	-0.789
	(1.083)
Centered R-Squared	0.6859
Un-Centered R-Squared	0.9838
Number of observations	215

< 0.1*, < 0.05**, and < 0.01***Sources: Survey Data 2009.

Note: Numbers in brackets are standard errors.

CONCLUSION

The education production function is used to analyze the impact of weekly working hours on the school results for the current school year. The model specification tests highlighted the importance of treating the child's weekly working hours as an endogenous variable. Therefore, two-stage least square is used after controlling for the poverty related variables that affect the number of hours a student works per week. The study found from the first-stage regression results that weekly working hours are affected by the state of poverty in the household, measured by monthly expenditure on electricity and the type of school in which the child is enrolled. The study results in the first chapter also show that working along with attending school is due to poverty, and the evidence presented here suggests that poorer children work for longer hours.

An important objective of this study was to observe the nature of the relationship between a child's number of working hours and their achievements in secular school. To explore any quadratic relationship that may exist between these two factors, the square of the weekly working hours is included in the education production function.

The study results indicate that any substantial number of hours of work in along with study hinder a child's school achievements, with a near-to-zero minimum safe number of hours per week of work. These results indicate that the relationship between working and attending school is negatively sloped rather than quadratic (inverted U shape). From a policy perspective, the results indicate that after controlling for the endogeneity of weekly working hours, one cannot suggest any optimum hours for children to work while attending school.

Among the household variables, results show that maternal education plays a positive and statistically significant role in child achievement. In keeping with other conclusions in this study, this finding again highlights the importance of an educated mother for a nation.

The study results for the variable 'level of the student in the school' demonstrate that,

keeping other variables constant, the negative impact of work on performance becomes smaller with the increase in the level of the students. These results promote some important future research questions to analyze the efficiency of working while obtaining education at college and university levels.

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