Why Should We Care About Child Labor?

The Education, Labor Market, and Health Consequences of Child Labor

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ABSTRACT

Despite the extensive literature on the determinants of child labor, the evidence on the consequences of child labor on outcomes such as education, labor, and health is limited. We evaluate the causal effect of child labor participation among children in school on these outcomes using panel data from Vietnam and an instrumental variables strategy. Five years subsequent to the child labor experience we find significant negative impacts on education, and also find a higher probability of wage work for those young adults who worked as children while attending school. We find few significant effects on health.

I. Introduction

The assumption that labor is harmful to children's development underpins both the theoretical literature and the policy debate on child labor. For example, from the policy perspective, there is a perception that the worldwide returns

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to eliminating child labor are very large (see International Labour Organization 2003), and in the theoretical literature, it is assumed that child labor has negative consequences (for example, Baland and Robinson 2000 assume that it displaces schooling). However, the evidence that rigorously quantifies the consequences of child labor is limited.

Both theoretically and empirically, it is not clear whether child labor substantially displaces schooling. In rural settings in developing countries (and more than 70 percent of child labor in developing countries is rural; International Labour Organization 2002), both school and child labor tend to be low-intensity activities, in contrast to the sweatshops and full-time work that characterize child labor in the popular imagination. Although a growing empirical literature (reviewed in Section III) analyzes the relationship between child labor and school attainment, with a few exceptions, this literature examines correlations, not causal relationships.

In this paper we examine the education, labor market, and health consequences of child labor among children attending school. Using data from rural households in Vietnam, we instrument for participation in child labor with rice prices, a variable that influences child labor but is plausibly exogenous with respect to household choices (we provide a detailed discussion of our empirical strategy in Section IV). We find that the mean level of child labor leads to a 46 percent reduction in the probability of being in school, a 21 percent decrease in educational attainment, and a doubling in the probability of working for wages five years later. We find mixed evidence of the effect of child labor on subsequent health.

The paper is organized as follows. Section II outlines our empirical strategy. Section III provides a review of the literature. Section IV describes the data. Section V presents our results on the consequences of child labor. Section VI concludes.

II. Empirical Framework

In this section we outline the framework we use to identify the effect of child labor on a range of subsequent outcomes.

A. Base Specification and Sample Restrictions

Our data are structured in two rounds, with Round 1 between 1992 and 1993 and Round 2 between 1997 and 1998. The treatment is defined as having participated in child labor in the first round of the survey, T_i. The outcomes (Y_i) of interest (school enrollment, highest grade completed, occupation, and health) are measured five years later. Thus our basic specification is of the form:

$$(1) \quad Y_{i,t+5} = \alpha + \beta T_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t+5},$$

where X_i are household and community-level controls. We impose several restrictions on the sample that we examine. First, we consider children between the ages of eight and 13. The prevalence of labor among younger children is low. Likewise, by some definitions, labor at age 14 and older would not be viewed as a particularly serious form of child labor. Second, we restrict the sample to those children who

were in school during the first round of interviews. If we were to include children who were not in school during Round 1, we also would have to include the school attendance variable in Equation 1 above, which then would create additional problems of identification (namely, identifying the separate effects of schooling and child labor in Round 1 on outcomes in Round 2). Instead, we identify the effect of child labor among those children who were in school in Round 1. Although this narrows the interpretation of the results we find, we believe it provides a cleaner estimate of the actual effect of child labor.[1]

Two potential sources of selection bias exist in estimating Equation 1 using OLS: between-household selection (that is, which types of households opt into child labor) and within-household selection (that is, which of their children parents select to work more or less).[2] To address the first, we control for a range of household characteristics, including parental education and household expenditure in Round 1; of course, omitted household characteristics that determine participation in child labor and that affect educational choices remain a concern. It is inherently more difficult to control for within-household differences among children, since our dataset does not include child-level ability measures. We address both sources of bias by using the instrumental variables strategy that is described below.

B. Instrumental Variables

Our instrumental variables specification is:

$$(2) \quad T_{i,t} = a + bZ_{i,t} + cX_{i,t} + \nu_{i,t}$$

$$(3) \quad Y_{i,t+5} = \alpha + \beta \hat{T}_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t+5},$$

where in Equation 2, Z_{it} is the instrument and in Equation 3 we make the necessary two-stage least squares adjustments.

The ideal instrument is one that induces variation in child labor (that is "relevant"), that is exogenous, and that affects the outcome of interest (for example, schooling and wage employment) solely through the child labor participation decision (that is "excluded"). The timing of the two rounds of our survey (1992–93 and 1997–98) provides us with a source of variation in the use of child labor that is unique to Vietnam, namely community rice prices (see Edmonds and Pavcnik 2005 and 2006). Prior to 1997, the inter-commune rice market in Vietnam was heavily regulated, with the sale of rice among communes facing restrictions comparable to international exports. This created substantial variation in rice prices, which we argue is relevant to child labor and exogenous. After 1997, trade in rice across communes was liberalized. As a result, rice prices in the second survey round are not significantly correlated with rice prices in Round 1; this strengthens our claim that 1993 rice prices are plausibly excluded from our outcome equation in Round 2. Thus, we use the price of rice at the community level in Round 1 as our instrument. We consider the issues of relevance, exogeneity, and exclusion in turn.

1. We replicated all the estimation for the sample of all children aged eight-13. Results were virtually unchanged.

2. See Horowitz and Wang (2004), who build a model around within-household heterogeneity among children. In our empirical results, a comparison of our OLS and IV estimates will shed some light on this issue.

Regarding relevance, rice prices potentially affect both the demand for and the supply of child labor.[3] Higher rice prices could lead to the decision to cultivate more rice, and hence increase the demand for child labor. Higher rice prices also would have an income effect on rice-producing households, leading households to reduce the supply of child labor. For our purposes, which effect dominates does not matter, as long as rice prices are relevant for determining child labor decisions.

As for exogeneity, since rice prices are determined at the commune level in Round 1 and outcomes are determined at the household level in Round 2, it is unlikely that there is direct reverse causation. The concern is instead the possibility of omitted variable bias, namely whether community rice prices in 1993 will be correlated with unobservable variables that could confound a causal interpretation of the effect of child labor five years later. However, mobility (and migration) of households across communes was limited in 1993, and there is no evidence that households sort themselves across communities based on their attitudes toward child labor (we provide some evidence for this in Section VB below). Both of these arguments suggest that we have no reason to expect community rice prices to be correlated with omitted variables that predict child labor, and hence that rice prices are exogenous with respect to child labor decisions.

The validity of the exclusion restriction requires more thought. The lack of correlation between rice prices across rounds provides prima facie evidence that rice prices are transitory during this period in Vietnam. We further strengthen this argument by controlling for rice prices in 1998 and community-level child wages in 1993 and 1998 in our regressions. This allows us to control for the contemporaneous rice price effect and unobserved village characteristics that could be correlated with the emergence of labor markets between 1993 and 1998. In a similar spirit, we control for (log) per capita expenditure to capture the direct effect of rice prices on poverty.

Nonetheless, two concerns remain. Rice prices are presumably the result of a demand-supply equilibrium within each commune, and as such might reflect structural features of the commune that could continue to affect schooling and labor decisions five years later. We address this concern by controlling for a range of structural factors that affect demand and supply (including population, income, and agricultural technology). Rice prices in 1993 could also affect outcomes in 1998 through other factors that have a persistent effect on households across rounds (such as household income growth or wealth). We attempt to address this concern by assessing whether 1993 rice prices predict wealth or income growth in Round 2.

III. Literature Review

A. The Child Labor-Schooling Tradeoff

An extensive literature examines the tradeoff between child labor and schooling. In this section, we highlight a few of the existing results.

3. See the discussion in Edmonds and Pavcnik (2004 and 2005). Similarly, Kruger (2007 and 2006) examines the impact of coffee prices on child labor in Brazil and Nicaragua.

Patrinos and Psacharopoulos (1995) show that factors predicting an increase in child labor also predict reduced school attendance and an increased chance of grade repetition. The authors also estimate this relationship directly and show that child work is a significant predictor of age-grade distortion (see Patrinos and Psacharopoulos 1997). Akabayashi and Psacharopoulos (1999) show that, in addition to school attainment, children's reading competence (as assessed by parents) decreases with child labor hours. Finally, Heady (2003) uses direct measures of reading and mathematics ability and finds a negative relationship between child labor and educational attainment in Ghana.

All of these papers examine the correlation, rather than the causal relationship, between child labor and schooling. As we discuss in detail below, there are many reasons to doubt that the two coincide. A few recent papers address this issue.

Using data from Ghana, Boozer and Suri (2001) exploit regional variation in the pattern of rainfall as a source of exogenous variation in child labor. They find that a one-hour increase in child labor leads to a 0.38 hour decrease in contemporaneous schooling. Cavalieri (2002) uses propensity score matching and finds a significant, negative effect of child labor on educational performance. Ray and Lancaster (2003) instrument child labor with household measures of income, assets, and infrastructure (water, telephone, and electricity) to analyze its effect on several school outcome variables in seven countries. Their findings generally indicate a negative impact of child labor on school outcomes.[4] However, their two-stage strategy is questionable, because it relies on the strong assumption that household income, assets, and infrastructure satisfy the exclusion restriction in the schooling equations. Finally, Ravallion and Wodon (2000) indirectly assess this relationship in their study of a food-for-school program in Bangladesh that exploits between-village variation in program participation. They find that the program led to a significant increase in schooling, but only one-eighth to one-quarter of the increased hours of schooling were attributable to decreased child labor. This suggests that child labor does not lead to a one-for-one reduction in schooling.

The link between child labor and subsequent labor market outcomes is examined by Emerson and Souza (2007) and Illahi, Orazem, and Sedlacek (2001). These papers show that, controlling for family background and cohort, early exposure to child labor significantly reduces earnings, but that no significant effect emerges for adolescents (which is closer to the age range that we examine). However, these papers do not address the endogenous choice to enter into child labor; thus, their findings cannot be interpreted causally.

In this paper, we make three contributions beyond these studies. First, we use instrumental variables to try to address the selection biases that emerge in child labor studies. Second, we examine education together with a labor market outcome (the probability of wage work), which allows us to take a first step in addressing the question of the net impact of child labor. Finally, we also consider the health consequences of child labor.

4. In some cases they find the marginal impact of child labor to be positive. In particular, for Sri Lanka, the impact is positive for all schooling outcomes.

B. Previous Research on Vietnam

The rapid economic growth in Vietnam in the 1990s has been characterized by a decline in both the incidence and intensity of child labor. Edmonds and Turk (2004) document the sharp decline in child labor in the 1990s, and Edmonds (2005) links this decline to significantly improved living standards. In particular, Edmonds and Pavcnik (2005, 2006) examine the effect that the integration of Vietnam's rice market had on child and adult labor markets. They find that the increase in rice prices between 1992–93 and 1997–98 was associated with reduced child labor. This result motivates the first stage of our two-stage least squares procedure. O'Donnell, Rosati, and Van Doorsaler (2005) investigate the impact of child labor on health outcomes for children in Vietnam. Using instrumental variables, they find no impact of child labor on growth and some evidence that work during childhood increases the likelihood of having an illness or injury five years later. We discuss their results further in Section VE.

Finally, regarding the rural labor market and returns to schooling, Glewwe and Jacoby (1998) note that it may not be efficient to keep productive family members in school. The evidence suggests that primary schooling raises productivity in agriculture, whereas secondary schooling does not provide additional productivity gains.[5]

IV. Data Description

We use data from the Vietnam Living Standards Survey (VLSS), a household survey that was conducted in 1992–93 and again in 1997–98. Both surveys were conducted by Vietnam's General Statistics Office (see www.worldbank.org/lsms). Of the 4,800 households interviewed in 1992–93, about 4,300 were reinterviewed in 1997–98. The surveys contain information on household composition, time use for children, educational attainment, and labor market activities of household members. In conjunction with the household survey, a community survey was conducted in rural communes to gather information such as the presence of schools, roads, electricity, local rice prices, and the occurrence of disasters in the community. For this paper, we use information on the panel of rural households with children between the ages of eight and 13 at the time of the 1992–93 survey.

We use two measures of children's subsequent human capital. School attendance, which is measured dichotomously, is an input in the formation of human capital and, as such, only a distant proxy for the outcome of interest, the accumulation of knowledge. However, existing evidence (see for example King, Orazem, and Paterno 1999) suggests that attendance covaries quite substantially with child labor (that is, working children attend school less regularly than nonworking children) and appears to be a better measure of time in school than, say, enrollment. We also use highest grade attained as an outcome, which is an output measure of the schooling process instead.

5. At the same time, the tradeoff to reduced schooling would be increased experience in working on the family farm which may have significant benefits (see, for example, Rosenzweig and Wolpin 1985).

We measure children's subsequent labor market participation with an indicator for children who are working for wages outside the household. In Vietnam, as in other developing countries, wage work is associated with a higher standard of living (Dollar, Glewwe, and Litvack 1998). Ideally, we would also examine children's actual wages or the marginal productivity of labor. However, since most children are engaged in joint production with their families and a relatively small proportion of children are engaged in wage work, we are unable to measure wages with sufficient precision. Thus we use a 0/1 indicator for wage work.

Table 1 provides an overview of our data, reporting the means for key covariates for four samples: all children in 1993, the subset of these children reinterviewed in 1998, children in 1993 in school, and the subset of these children who were reinterviewed. This last sample, 2,158 children, is the group on which we will conduct the subsequent analyses. The means in both 1993 and 1998 do not differ significantly between these groups. Of the 2,158 children between the ages of eight and 13 in our sample, 648 (30 percent) were working in the 1993. We measure child labor hours as the total hours the child was engaged in income-generating work, including work on the family business or farm. The majority of children working in either the first survey (1992–93) or the followup survey (1997–98) were working as unpaid family labor in agriculture or nonagricultural businesses run by the household.[6] The average work intensity is seven hours per week, but among children who work, it is 24 hours per week. The gender distribution of working children is balanced. Parental education is higher and per capita expenditure is lower in households where children work.

The middle section of the table summarizes the instrument we use to identify the decision to send a child to work: community-level rice prices in 1992–93. There is substantial variation in rice prices in 1992–93. As noted in Benjamin and Brandt (2003) and Edmonds and Pavcnik (2005), the variation in rice prices in 1992–93 stems from the restrictions on the sale of rice across communities prior to 1997. Rice prices do not appear to be unconditionally correlated with child labor. However, these are highly significant predictors of child labor in a regression framework. We discuss the instrumental variable specification and the validity of rice prices in the next section of the paper.

Finally, Table 1 summarizes the outcomes of interest. In the second survey round, 63 percent of children are in school overall. The rate of school attendance is eight percentage points higher among nonworking children than among those who worked in 1993 (not reported). Though there tend to be more schools in villages where children do not work, we find that the schooling-child labor relationship is significant even after controlling for this difference. The level of educational attainment is higher among working children. Finally, we note that children who work in the first round do not appear to be more likely to be working for a wage by 1997–98. One might also be concerned about attrition, in that children more (or less) likely to be working in the second round could be more likely to drop out of the sample. Similar

6. The concept of child labor (by ILO standards) does not necessarily refer to simply any work done by a child, but, rather, to work that stunts or limits the child's development or puts the child at risk. However, in household survey data it is difficult (perhaps impossible) to appropriately isolate the portion of time spent working on the farm that qualifies under this nuanced definition.

Table 1
Descriptive Statistics of Rural Children 8-13 in 1992–93

	(1) All	(2) Reinterviewed in 1997–98	(3) In school in 1992–93	(4) Reinterviewed in 1998 and in school in 1992–93
Characteristics in 1992–93				
Labor hours (wage + nonwage) in the last seven days	8.55	8.23	6.96	7.15
	(14.86)	(14.24)	(12.55)	(12.69)
Age	10.39	10.28	10.23	10.16
	(1.69)	(1.66)	(1.64)	(1.61)
Male[(a)]	0.50	0.52	0.52	0.52
	(0.50)	(0.50)	(0.50)	(0.50)
Father's education (years)	6.78	6.85	7.20	7.11
	(3.93)	(3.81)	(3.85)	(3.77)
Mother's education (years)	5.11	5.19	5.56	5.47
	(3.60)	(3.52)	(3.54)	(3.49)
log per capita expenditure	7.28	7.29	7.33	7.32
	(0.48)	(0.45)	(0.45)	(90.44)
Rice price (/1000)	1.76	1.77	1.76	1.76
	(0.24)	(0.24)	(0.24)	(0.25)
Outcomes in 1997–98				
In school[(a)]		0.58		0.63
		(0.49)		(90.48)
Highest grade attained		7.21		7.57
		(2.49)		(2.30)
Wage worker in last seven days[(a)]		0.08		0.06
		(0.26)		(0.24)
Any illness in last four weeks[(a)]		0.27		0.28
		(0.45)		(0.45)
Number of days ill in last four weeks		1.60		1.59
		(3.89)		(3.86)
BMI		17.88		17.83
		(1.96)		(1.96)
Number of observations	3,049	2,419	2,579	2,158

Notes: Excludes observations with missing data among the list of covariates (excluding parental education) for 1993 and, for Columns 2 and 4, missing data in 1998 (excluding wage estimates and BMI). The sample size unconditional on complete data is: (1) 3,099 (2) 2,631 (3) 2,625 and (4) 2,282. (a) This is a binary variable, equal to 1 if true, else equal to 0.

Table 2
Outcomes in 1997–98, conditional on being in school in 1992–93: OLS

Dependent variable	(1) In school	(2) Highest grade attained	(3) Wage worker in last 7 days
Labor hours 1992–93	-0.001	-0.005*	0.001*
	(0.001)	(0.003)	(0.001)
Male	0.095***	0.075	-0.005
	(0.018)	(0.068)	(0.010)
Father's education	0.009***	0.049***	-0.003**
	(0.003)	(0.012)	(0.002)
Mother's education	0.021***	0.070***	0.001
	(0.003)	(0.013)	(0.002)
Ln per capita expenditure 1992-93	0.115***	0.476***	-0.040***
	(0.024)	(0.090)	(0.012)
R-squared	0.25	0.55	0.06
Number of observations	2,158	2,158	2,158

Notes: Standard errors are in parentheses and are clustered at the community level. *** indicates significance at 1 percent; ** at 5 percent; and, * at 10 percent. Other regressors included, but omitted from the table, are grade in 1992–93, BMI in 1992–93, age, indicator variables for missing parental education, region fixed effects, rice price 1997–98 and community wage rates for children in 1992–93 and 1997–98.

to Edmonds and Turk (2004), we do not find this problem to be severe. The simple correlation between having worked or hours worked as a child and the probability of being in the sample in Round 2 is 0.0165 and 0.0167 respectively. In attrition regressions, controlling for other covariates, neither work variable is significantly associated with reinterview (results not reported). Among the full sample of 3,049 children in 1993, the correlation between our instrumental variable, community rice price in 1993, and being reinterviewed in 1998 is 0.07.

V. Results

A. OLS

We begin by briefly discussing the OLS relationship between child labor and our outcomes. Although we do not believe that these estimates are causal, they are a useful reference point for our subsequent instrumental variables results. In looking at the first row of Table 2, we note that child labor in the first round is significantly associated with two outcomes: highest grade attained and the probability of wage work. The mean level of child labor hours is associated with a reduction of 0.35 years in the highest grade attained (compared to an average of 7.2 years), and a 7 percent

Table 3
First Stage Estimates, Dependent variable: Labor Hours in 1992–93

	(1)	(2)
Rice price 1992–93	-3.91***	-3.75***
	(1.11)	(1.12)
Male	-0.27	-0.31
	(0.49)	(0.50)
Father's education	-0.27***	-0.28***
	(0.09)	(0.09)
Mother's education	-0.17*	-0.21**
	(0.10)	(0.10)
Ln per capital expenditure 1992–93	-1.42**	-1.15*
	(0.61)	(0.63)
Rice price 1997–98	0.75	0.24
	(0.60)	(0.62)
Population (/1000)		-0.07
		(0.05)
Road passing by[(a)]		2.22***
		(0.89)
Village electrified[(a)]		-0.80
		(0.94)
Number of tractors		-0.01
		(0.02)
F-test on instruments		
Number of observations	2,158	2,107

Notes: Standard errors are in parentheses and are clustered at the community level. *** indicates significance at 1 percent; ** at 5 percent; and, * at 10 percent. Other regressors included, but omitted from the table, are grade in 1992-93, BMI in 1992-93, age, indicator variables for missing parental education, region fixed effects, rice price 1997-98, and community wage rates for children in 1992-93 and 1997-98. (a) This is a binary variable, equal to 1 if true, else equal to 0.

reduction in the probability of being a wageworker. More child labor is associated with lower attendance, although this effect is not statistically significant. All the specifications also control for BMI, a proxy for heterogeneity in parental investment in children's health at baseline.

Given the many selection problems with these results, we do not attempt to interpret them further.

B. Instruments: Relevance and Exclusion

In Table 3 we present the first stage of our instrumental variables regression. Column 1 reports our basic specification, with rice prices as our instrument. Rice prices are a highly significant predictor of child labor, with an *F*-statistic of 13.75. Higher

rice prices are associated with reduced child labor, suggesting that the income effect dominates the labor demand effect. A one standard deviation increase in rice prices leads to a one hour per week reduction in child labor. In Column 2 we present an alternative specification which we also use below. In particular, we include additional community controls—population, distance to roads, electrification, and number of tractors—because these are potentially relevant for selection into child labor at the community level and could affect the validity of the exclusion restriction. The coefficient on rice prices is similar, and the instrument is significant at the 1 percent level.

Having established that our instrument has power in the first stage, we next consider the plausibility of satisfying the exclusion restriction. In particular, our concern is that the instrument may be correlated with an omitted variable. For example, rice prices are related to agricultural production, which could be correlated with community attitudes toward child labor. Rice prices could also drive changes in household income. Although it is not possible to test the validity of the instrument with respect to all of the potentially excluded variables, we can examine their correlation with a range of relevant variables that are observed.

In Table 4 Column 1, we consider whether rice prices in the first survey round predict the future occurrence of shocks and disasters at the community level (see Morduch 1994); there is no significant relationship. In Column 2 we consider whether the instrument is correlated with the presence of secondary schools within communities—which may reflect a preference for education—and find no significant effect. In Column 3, there is no evidence that the value of durable assets (a measure of wealth) in the second survey round is correlated with rice prices in the first survey round. This suggests that correlation between rice prices and household wealth should not explain away our results regarding the effect of child labor on schooling. In Columns 4 and 5 we confirm that the instrument is not correlated with the incidence of illness among children in the previous month or previous 12 months. In particular, if rice prices were correlated with community-level attitudes toward children's welfare, then we might expect to find not only a greater use of child labor but also worse health. We do not find evidence of this.

Finally, in Column 6 we examine whether the instrument predicts growth in per capita expenditure at the household level. If rice prices were to significantly predict household expenditure, this would suggest that commune-level rice prices are associated with some structural feature of the community (such as agricultural productivity or quality of infrastructure) and thereby potentially violate the exclusion restriction. We do not find any significant relationship.

Overall, these results support our use of rice prices as a valid instrument for child labor.

C. Main Results

In Table 5, we present our benchmark results. Working as a child during the first survey round leads to a significantly lower level of school attendance five years later. The mean level of child labor leads to about a 46 percent reduction in the proportion of children attending school. In Column 2 we show results for highest grade completed. We see that the effect is negative and significant at the 1 percent level; children who worked in the baseline survey have a significantly lower level of

Table 4
Robustness of the Instruments: Outcomes in 1997–98

Dependent variable	(1) Community disaster 1997–98	(2) Upper secondary school in village 1997–98	(3) Log (Value of durable assets) 1997–98	(4) Ill in the last month 1992–93	(5) Ill in the last 12 months 1992–93	(6) Growth in log (per capita expenditure) 1992/93–1997/98
Rice price 1992-93	0.000	0.021	0.104	-0.026	-0.072	0.033
	(0.094)	(0.138)	(0.185)	(0.049)	(0.065)	(0.053)
Number of observations	223	223	1,417	2,158	2,158	1,417
Regression run at level of	Community	Community	Household	Individual	Individual	Household

Notes: OLS estimates. Standard errors are in parentheses and are clustered at the community level. *** indicates significance at 1 percent; ** at 5 percent; and, * at 10 percent. Other regressors included, but omitted from the table, are region fixed effects, Ln per capita expenditure (Columns 3-6), and grade in 1992–93, BMI in 1992–93, age, parental education, indicator variables for missing parental education, gender, rice price 1997–98, and community wage rates for children in 1992–93 and 1997–98 (Columns 4-5).

Table 5
Outcomes in 1997-98, conditional on being in school in 1992-93: IV

Dependent variable	(1) In School	(2) Highest Grade Attained	(3) Wage Worker in Last Seven Days
Labor hours 1992-93	−0.040***	−0.225***	0.012**
	(0.015)	(0.072)	(0.006)
Male	0.086***	0.026	−0.003
	(0.026)	(0.127)	(0.011)
Father's education	−0.001	−0.008	−0.000
	(0.006)	(0.028)	(0.002)
Mother's education	0.014**	0.032	0.003
	(0.006)	(0.030)	(0.002)
Ln per capita expenditure 1992-93	0.058	0.152	−0.024
	(0.040)	(0.194)	(0.016)
Percent effect at mean of work hours	46%	21%	144%
Number of observations	2,158	2,158	2,158

Notes: Standard errors are in parentheses and are clustered at the community level. *** indicates significance at 1 percent; ** at 5 percent; and, * at 10 percent. Other regressors included, but omitted from the table, are grade in 1992–93, BMI in 1992–93, age, indicator variables for missing parental education, region fixed effects, rice price 1997–98, and community wage rates for children in 1992–93 and 1997-98.

educational attainment. The magnitude is significant as well: a mean level of child labor leads to a 1.6 year (21 percent) decrease in educational attainment.

In Column 3 we examine the impact of child labor on the likelihood of wage employment. The effect of child labor on the proportion of respondents who are wage workers in the second round of the survey is positive and significant at the 5 percent level: at the mean level of work, child labor more than doubles the likelihood of being a wage worker in the second survey round.

How should these results be interpreted? There are three margins to consider. First, we are identifying the effect of child labor hours among those children in school. Thus, the negative effect of work on educational attainment operates through leaving school at an earlier age rather than on enrollment as a child. Given the erosion in educational attainment, our results on wage work suggest the possibility of returns to increased work experience, although of course this is impossible to quantify without wage data.[7]

7. We also investigated the impact of child labor on wages by constructing "shadow wages" based on an estimate of marginal productivity of labor for age and gender groups for farm households. This shadow wage estimate was used as a proxy for unobserved wages for nonworking respondents. The results indicate higher wages for respondents who worked as children. However, given the large share of wages that are imputed (94 percent), we do not report these results. They are however available in the working paper version of Beegle, Dehejia, and Gatti (2005).

Second, it is worth noting that we find similar results when, in addition to child labor in income-generating work, we include household chores as well. In our sample, children average six hours of chores per week (ten for children who do chores). Girls' chores average 1.5 hours more per week than boys, which is a statistically significant difference. Overall, children in the sample work 13 hours per week both in income-generating work (dominated by working on household farms) and in chores. Thus, the negative effect of child labor seems to be related to the disruption caused by incremental work hours while in school, not a particular type of work.

Third, it is interesting to note that the IV estimates are larger than the OLS estimates. To the extent that families send the less academically gifted children to work (and child ability is unobservable), OLS should overestimate the impact of child labor on schooling relative to the causal effect (as estimated by IV). Our results instead support the view that families send their more academically gifted children to work (possibly because they are also more productive), which validates one of the key predictions of the model presented in Horowitz and Wang (2004).

D. Robustness of the Results and Instrument

The causal interpretation of the results presented in the previous section relies on the validity of the instrument. In this section, we explore—and try to rule out—two arguments against our instrument.

The first concern is that Southern Vietnam is a rice-growing (and rice surplus) region, whereas Northern Vietnam is a rice deficit region. In 1992–93, there were severe restrictions to trade across regions, which led to lower rice prices in the South than the North (Edmonds and Pavcnik 2005). If low rice price (high child labor) areas experienced relatively more rapid development of their labor markets, then this could explain the results for wage work increases among children who were working in the first survey round. To test for this, we use our base specification to estimate the effect of adult work on adult earnings five years later. If the wage work result were simply due to a labor market effect, then we would expect to find a significant effect for adults. However, we do not find any significant effect (Column 1). Second, North and South could differ in their levels of, and attitudes toward, education and child labor. We test for this by restricting our sample to communities in the North. This is presented in Column 2 for highest grade attained, and the child labor effect is similar in sign and significance to our base results.

More generally, we are concerned that the instruments may not be excluded from the outcome equations. As discussed in Section IIB, we address this by controlling for a range of structural variables that could drive price differences. To account for community factors driving the demand for rice, we control for population (in addition to household per capita expenditure which accounts as well for between-commune differences in levels of expenditures). On the supply side of rice, we control for variables related to technology, including village electrification, presence of roads, and use of tractors. The results for highest grade attained are presented in Table 6, Column 3. The estimated coefficient is comparable in sign and magnitude to Table 5.

Table 6
Outcomes in 1997-98, conditional on being in school in 1992–93: IV Robustness

Dependent variable:	(1) Adult wage per day[a]	(2) Highest grade attained, Northern VN	(3) Highest grade attained
Labor hours 1992-93[b]	0.172	-0.341*	-0.242***
	(0.126)	(0.175)	(0.081)
Male	2.136***	0.195	0.008
	(0.587)	(0.279)	(0.136)
Father's education	-0.001	-0.027	-0.016
	(0.054)	(0.058)	(0.031)
Mother's education	0.146*	-0.036	0.024
	(0.088)	(0.077)	(0.033)
Ln per capital expenditure 1992-93	0.350	-0.376	0.155
	(0.263)	(0.651)	(0.199)
Community characteristics 1992-93			
Population (/1000)			0.009
			(0.015)
Road passing by[c]			0.566*
			(0.325)
Village electrified[c]			-0.465*
			(0.254)
Number of tractors			0.001
			(0.005)
Number of observations	5,916	1,150	2,107

Notes: Standard errors are in parentheses and are clustered at the community level. *** indicates significance at 1 percent; ** at 5 percent; and, * at 10 percent. Other regressors included, but omitted from the table, are grade in 1992-93, BMI in 1992-93, age, indicator variables for missing parental education and tractors, region fixed effects, rice price 1997-98, and community wage rates for children in 1992-93 and 1997-98. Results are robust to controlling for availability of schools and roads at the village level. (a) Wages per day is estimated farm wage. (b) Own labor hours from the sample of adults are used as regressors. (c) This is a binary variable, equal to 1 if true, else equal to 0.

E. Health Effects

Beyond the intrinsic importance of health for well-being, improved health status is widely recognized to lead to greater economic productivity (Strauss and Thomas 1995), and can interact with school performance (see, for example, Glewwe, Jacoby, and King 2001; Alderman *et al.* 2001). The existence of a significant health effect could offset (or reinforce) a tradeoff between child labor and subsequent well-being. In particular, worse health could offset some of the potential gains from increased participation in wage work that were noted previously. In this section, we examine the effect of child labor on subsequent health outcomes.

Table 7
Health Outcomes in 1997-98, conditional on being in school in 1992-93

Dependent variable	(1) Any illness	(2) Days ill if ill	(3) Growth	(4) BMI
Labor hours 1992-93	0.032**	-0.172	-0.011	0.007
	(0.014)	(0.406)	(0.209)	(0.038)
Number of observations	2,158	607	1,997	1,997

Notes: Labor hours are predicted using instrumental variables. Standard errors are in parentheses and are clustered at the community level. *** indicates significance at 1 percent; ** at 5 percent; and, * at 10 percent. Other regressors included, but omitted from the table, are grade in 1992-93, BMI in 1992-93, age, gender, and indicator variables for missing parental education, region fixed effects, rice price 1997-98, and community wage rates for children in 1992-93 and 1997-98. In Column 3, growth is measured as the change in natural logarithm of body mass index (BMI) controlling for lagged value of BMI.

As with schooling, there is no single satisfactory indicator of health. We use two self-reported measures and a physical assessment. First, we first examine an indicator of whether the individual had any illness in the previous four weeks, ranging from headaches and cough to fever, diarrhea, and infection. The second health measure is the number of days the individual suffered from any of these illnesses in the previous four weeks if sick. Third, we use body mass index (BMI), an indicator of current nutritional status, which is computed as weight in kilograms divided by squared height in meters. This measure has been found to be associated with physical health and to be positively related to productivity and earnings.

We present our estimates in Table 7. Column 1 shows that child labor significantly increases the probability of illness. In Column 2 we see that the number of days ill among those who have been ill does not significantly increase with child labor. These results differ from those reported by O'Donnell, Rosati, and Van Doorsaler (2005) who find in a bivariate probit specification that child labor is associated with a higher likelihood of a recent illness or injury five years later among rural children 6–15 years. These results are not, however, directly comparable. Our results identify the effect of child labor on health only among children who were *in school* in 1993. As discussed above, this allows us to abstract from the issue that child labor can affect contemporaneous schooling decisions. In turn, schooling might affect health in the following survey round, in which case O'Donnell, Rosati, and Van Doorsaler (2005) are estimating a child labor-cum-education effect, while we identify a "pure" child labor effect, albeit on the sample of children in school.[8] We find no significant

8. When we try to match specifications in terms of the same outcome and sample (all rural children aged six-15 years), we failed to replicate their results. This may be due to the smaller sample size in their estimation (3,370) whereas their overall sample consists of almost 4,000 children (see Tables 4 and A2 respectively in their paper). It is not stated why the sample in the estimation is lower by almost 15 percent.

impact of child labor on growth or body mass index in Columns 3 and 4. O'Donnell, Rosati, and Van Doorsaler (2005) also found no evidence that working when young impedes growth.

Overall, the results on health outcomes are mixed. For some outcomes we find a negative effect of child labor on health, but not on others.

VI. Conclusion

Much attention has been devoted recently to the problem of child labor. While the moral distaste for some extreme types of child labor is beyond question, we feel—particularly in developing countries where most child labor is rural and is a relatively low-intensity activity—that it is important to determine empirically to what extent child labor in fact has harmful consequences for children later in life. We view our work as a step in this direction. We find that child labor significantly reduces school attainment. As is common in the context of developing countries, individual earnings for work, wage or self-employment including farming are not available, and we are thus unable to quantify the impact of child labor on future earnings. However, we find that child labor is associated with an increased likelihood of wage work, which is itself linked with higher living standards. The increased participation in this activity implies the possibility that some of the negative effects of foregone schooling could be offset by the benefits of the earlier work experience as a child. Although we cannot compare the costs of child labor in terms of lower schooling with the potential gains in terms of income in the absence of more precise wage and labor productivity data, these results suggest that there could be some medium-run economic benefits to child labor in addition to the costs we have discussed. Finally, we find no consistent evidence of a negative effect of child labor on health.

Overall, we believe that our results justify ongoing interest in the issue of child labor and suggest directions for future research. Two of the limitations of the present analysis that we hope to address in future work include: obtaining data on wage rates and agricultural productivity, and extending the time horizon of study. This would allow for a longer-term analysis of the costs of child labor and of the possible economic returns to work experience when young.

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