School Attendance, Child Labor and Local Labor Markets in Urban Brazil

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Abstract

While the income (poverty) effect on child labor is long established as a main determinant of child labor, there is a growing body of literature considering the pull of the labor market. This paper demonstrates that ceteris paribus, employment rates for 14-16 year old boys and girls in urban Brazil increase as local labor market opportunities improve. Children are also more likely to leave school as local labor market conditions become more favorable. The effects of aggregate shocks on children's school and work behavior are examined with particular focus on whether the income effect or substitution effect dominates as macroeconomic conditions change over time. The study uses data from the Pesquisa Nacional Amostra de Domicilios, a large household survey that is conducted almost annually by the IBGE. We use variation in the urban areas of 25 states over 12 years to identify the aggregate effects.

Introduction

Recently, researchers have given renewed attention to the issue of child labor, with lively debates ensuing regarding the causes of child labor. One school of thought is that child labor is caused primarily by poverty. The looming global recession would be expected to push children into work and out of school as parent's incomes fall. However, some Latin American evidence casts doubt on the hypothesis that child labor is determined entirely by poverty. In Brazil, and to a lesser extent in other Latin American countries, evidence exists that rates of child labor are higher at times and in places where children have better work opportunities as measured by local labor market conditions.

The decision to send children to school is closely related to the decision to send children to work. The benefits of child labor are related to local labor market conditions. When children face favorable work conditions, the opportunity costs of schooling increase. Market work opportunities tend to be better and also more acceptable for boys than for girls, so that boys face higher opportunity costs of schooling than girls. Therefore, we examine separately impacts for girls from impacts for boys.

A problem that arises in this literature is the difficulty of distinguishing the income effects of increased child wages from the substitution effects. Some studies, discussed in detail below, have found that child wages have a negative impact on child labor. We are able to distinguish between income and substitution effects by using time-varying data. The data, the Pesquisa Nacional por Amostra de Domicilios (PNAD), are repeated cross sections covering the period 1977 to 1998. The sample size is large enough that we are able to get good aggregate measures of local labor market conditions. We also distinguish between income and substitution effects of child wages by comparing regression results that include and exclude controls for household income.

In this paper, we provide a literature review of recent work on child labor and child schooling, focusing on previous work for Brazil. We also present an overview of recent trends in child labor and child schooling, showing that child labor has been decreasing steadily and child schooling has increased since the mid-1990s. The trends show remarkably variation over time, with peaks in child labor during boom years. We use bivariate probit models to allow correlations between the decisions to send children to school and to work, pooling several years of PNAD data. All the models are fully interacted with gender, so that we can carefully examine gender differences in the determinants of child labor and child schooling, which many previous studies have neglected to do.

Literature review

Researchers have recognized the importance of opportunity costs in schooling decisions at least since Gary Becker first wrote about human capital in the 1960s. In Becker's analysis, parents want to invest in children's schooling up to the point where the marginal cost equals the marginal benefit. Marginal costs of schooling increase as the child's market wage increases. In Latin America, empirical evidence suggests that the opportunity cost of children's market wages does impact school enrollment. A study by Jacoby and Skoufias in Peru (1997) found that the child wage has a negative effect on children's schooling. The child wage is calculated at the village level as the average wage of children who work in the market. They did not report results by gender. A study by Levison, Moe, and Knaul (1999) of child labor and education in Mexico found that the child wage had a negative effect on the probability that the child would work only, and a positive effect on the probability that a child would work and attend school, relative to the child only attending school. The child wage included in the time allocation regression was estimated using the Heckman procedure to correct for sample selection bias. The authors acknowledged that the sample selection procedure was problematic, because the same variables used to estimate the corrected estimated wages were also determinants of the child allocation decision so that the effect of children's wages on time allocation was confounded with other factors.

Whereas a wealth of studies exist regarding the determinants of school attendance and child labor in particular countries, the lack of degrees of freedom in time varying data has limited the research on the effects of macroeconomic conditions on children's time allocation. In a notable exception, Binder (1999) did a study of schooling in Mexico during the 1980s using state-level schooling indicators. She used the states' tax revenues as a proxy for opportunity costs of schooling, and found a negative relationship between tax revenues and children's schooling outcomes. During high revenue times, children were less likely to attend school. The aggregate level schooling data did not permit Binder to examine whether boys or girls responded differently. Another limitation of this study was the suitability of state tax revenues as a proxy for children's labor market opportunities.

Studies specific to Brazil have also found that labor market opportunities have impacts on children's labor supply. Barros et al. (1994) found that the incidence of child labor tended to be higher in wealthier states than in poorer states and in a short time series of national data, higher during good economic times than during poor economic times. For example, child labor was higher in the southern developed state of Sao Paulo than in the impoverished northern state of Bahia. In a study that looked at child labor from 1981 to 1996, da Silva Leme and Wajnman (2000) found that when national unemployment was high, school enrollment increased. The unemployment effect was interpreted as children being more likely to attend school when it was difficult to find jobs. However, the study did not find any effect of national wage levels on children's attendance. The da Silva Leme and Wajnman paper also did not investigate whether the effects of wages differed for boys and girls. Neri and Thomas (2001) used the Pesquisa Mensal do Emprego (PME), which is a short panel of monthly employment data, and found that child labor was above a fitted trend line during times of economic growth. Child employment was on the trend line during recessions. The probability that a child repeated a grade was also above a trend line during times of growth rather than during recessions. A study by Kassouf (1998) found using the 1995 Pesquisa Nacional por Amostra de Domicilios (PNAD) data that the higher the child's estimated log wage, the less likely the child would be in school. Also, the higher the child's estimated wage, the more likely that the child would be employed. The effects of the child's estimated wage on schooling and on employment are stronger for boys than for girls. A study by Barros, Mendonça, Deliberalli, and Bahia (2000) using the 1998 PNAD data found that the child's wage had an unexpected negative effect on child employment. The child wage was measured by taking the average child wage for the municipality. The negative effect might have resulted because the child wage was a proxy for state income levels. The study did not look at the impact of the child wage on current school enrollment rates. Most studies have found that in Brazil, child labor is procyclical, indicating that opportunity costs have an important impact on children's schooling.

Finally, in the most comprehensive look at opportunity costs to date, Barros, Mendonça, and Santos (1999) looked at the expected wage as the measure of the opportunity cost of schooling. The expected wage was defined as the wage of a standard worker in the local labor market times the probability that a person with the characteristics of the standard worker would find a job.[1] The wage of a standard worker was defined using regression analysis, predicting a wage for each worker in a community, and taking the median difference between the actual wage and the predicted wage as a measure of the labor market situation. This was then multiplied by the probability of finding work in that community. The outcome variable was years of schooling, and the analysis focused on children and young adults aged 11 to 25. The study used the 1996 PNAD and also the Pesquisa Sobre Padroes de Vida 1996–97 (PPV).[2] For the PNAD data, opportunity costs were found to have a statistically significant, negative effect on schooling. Also, males' response to opportunity costs was stronger than females' response to opportunity costs, and the effect was stronger in the Northeast than in the Southeast. However, the study did not establish for certain that opportunity costs affected schooling because the analysis using the PPV did not support the opportunity cost hypothesis. For the PPV, the effect of opportunity costs on schooling was not statistically significant. Also, the effects of the expected wage on schooling were marginally statistically significant and positive when the regressions included measures of access to schooling.

While various papers have examined the effects of aggregate conditions on schooling and child work in Latin America, none have controlled for individual family characteristics while permitting time variation in local labor markets. Recognizing that unobserved heterogeneity at both the individual level and state level is of primary concern in the estimation procedures, this study aims to answer the question of how children's time allocation changes when local labor market conditions change. It also seeks to address how policy might be linked to different types of aggregate fluctuations.

[1] This expected wage was defined in two ways—once using the probability that an unemployed standard worker would get a job and a second time as the probability that an economically active standard worker would get a job.
[2] The PPV is considered the World Bank Living Standards Measurement Survey for Brazil.

Although Becker's theory implies that income should not matter if perfect credit markets exist, the vast majority of studies of schooling determinants in developing countries find that income does matter. Income is also found to affect child labor. Many theoretical stances are consistent with a finding that income affects child labor and schooling. One would be that credit markets do not work well. Also, if schooling is a normal good and child leisure is a normal good, an increase in income will tend to increase children's schooling and leisure time.

A recent article by Basu (1998) sets out a theoretical model of child labor. In the model, parents do not want children to work and child labor is a response to poverty. An implication of the model is that threshold effects exist with respect to poverty and child labor. Societies move towards equilibria with either high levels of child labor or no child labor depending on income levels. Bhalotra (2000) finds that child work is caused by poverty in Pakistan. She argues that if child work is necessary to maintain a subsistence level of household income, then the elasticity of child labor supply with respect to child wages should be close to –1. She finds that this condition holds for households in the first quartile of the expenditure distribution. In Bhalotra's sample children work to achieve a target level of household income.

Other empirical work by Filmer and Pritchett (1998) and Knodel and Jones (1996) present descriptive statistics from a variety of developing countries to show that educational attainment differs widely by socioeconomic status within countries. Knodel and Jones go on to argue that the socioeconomic differential is much more important than the gender differential in schooling, and policymakers should focus more attention on narrowing socioeconomic differentials in schooling than on narrowing gender differentials.

These studies tend to focus on Asian and African countries. The Latin American context might be quite different. Brazil is much wealthier than countries like Bangladesh and Tanzania, yet it has a relatively high rate of child labor. As discussed earlier, Barros et al. (1994) challenged the poverty hypothesis and raised doubts that child labor in Brazil is caused by poverty.

A growing literature looks at the effects of credit constraints on child labor and schooling. A study by Jacoby (1994) found that borrowing constraints negatively affect children's schooling attainment in Peru. Another study by Jacoby and Skoufias (1997) also found that children's school attendance responded to income shocks in rural India, but not in a way that resulted in substantial loss of school attainment on average. Duryea (1998) used the PME from Brazil and found that children were less likely to complete a grade when their fathers experienced a spell of unemployment. Parker and Skoufias (2000) used data from urban Mexico to examine the impacts of employment shocks on children's schooling. They found that girls who lived in a household where the household head lost his job were more likely to drop out of school, whereas boys' schooling was not affected by employment shocks. To properly test for credit constraints, longitudinal data are necessary so that permanent income can be distinguished from temporary income. If children's schooling responds to temporary changes in income, then credit constraints affect schooling.

Empirically, one of the most important determinants of children's schooling and employment is mother's education. Often, mother's schooling is found to have a stronger effect on children's time allocation than father's education does (Barros, et al. 2000, Kassouf 1998). Barros, Mendonça, and Santos (1999) concludes that parents' schooling, and especially mothers' schooling, is by far the most important determinant of children's schooling. Parents' schooling has a much greater impact on their children's schooling than income, opportunity costs, or measures of school quality. Although this result is well established, the reasons why mother's schooling has such a strong impact are not well understood. Mothers with high levels of education probably have a high preference for schooling, so the result could reflect parental preferences. Mothers with high levels of schooling are likely to also have more power within the household than mothers with low levels of schooling have. If mothers have more of a preference to spend household resources on schooling than fathers do, then when mothers have more bargaining power, more resources are allocated to children's schooling. Finally, because mothers spend more time caring for their children than fathers typically do, mother's education might lower the cost of schooling more than fathers' education does. Educated mothers have more time intensive ways of interacting with their children than uneducated mothers. More work is necessary to determine why mother's schooling has such a strong impact on children's schooling.

Finally, the effects of rising divorce rates and increasing incidence of single-parent families on children's outcomes has received much attention in the United States. As of now, few studies examine the effects of changes in family structure on children's schooling and work in developing countries. The literature using U.S. data finds that children who live with single parents have lower educational attainment than children who live with both parents, even after controlling for income. The effects of living in a single mother household tend to be stronger for boys than for girls (Krein and Beller 1988, McLanahan and Astone 1991). Living in a single parent household is hypothesized to affect children's outcome in three ways. First, single parent households have lower income than two-parent households. Even when controlling for current income, single-parent status might also indicate lower permanent income. Second, single parents are not able to provide as much child supervision as two-parent households can. Therefore, children are more able to shirk doing homework in single parent households than two-parent households. Third, boys are thought to be at risk when they do not have a male role model within the household. Although the proportion of children living in single-parent households in Brazil has been increasing over time, no studies have looked to see the impact on boys' and girls' time allocation.

Studies that compare single-parent households where the parent is the father to single-parent households where the parent is the mother find that the presence of the mother has stronger positive effects on children's schooling than the presence of the father. Levison et al. (1999) finds that when the mother is present, children are less likely to be working and more likely to be in school. The effects of having a father present are similar, but smaller in magnitude than the effects of the mother's presence. In the United States, a study by Biblarz and Raftery (1999) also finds that the mother's absence has a larger effect on children's schooling than the father's absences. Once socioeconomic status is adequately controlled for, children raised by single mothers are better off than children raised by single fathers. These findings are consistent with the literature on intrahousehold distribution, which typically finds that resources controlled by mothers have larger impacts on child schooling than resources controlled by fathers.

One way that economic shocks might impact child labor and children's schooling is through the effect that such shocks have on the probability that a mother and father will stay together. Economic stress tends to increase the likelihood that a marriage will break up, as the benefits of marriage decrease and uncertainty increases (Becker?).

Theory

The decision for children to go to work or to school or both is a time allocation decision. In our case, parents and children decide how to allocate the child's time and they agree on the outcome. The decision could also be considered as the outcome of a bargaining process among parents and children. Estimating a bargaining model would be very difficult in the absence of information about what happens within households. We need more information about who actually makes these decisions (mothers, fathers, or children), and about how to identify bargaining power. There is a well-developed literature looking at bargaining outcomes between husbands and wives, but to date, no empirical studies have looked at bargaining outcomes between parents and children or between mothers, fathers, and children. For simplicity, we assume that the child's involvement in work and school is the result of a unitary household decision.

The household decision-maker maximizes a two-period utility function where the time periods are t and t+1. In the equation below, the household comprises three people: a father (f), a mother (m) and a child (c).

$$V = \omega_f U_{ft} + \omega_m U_{mt} + \omega_c U_{ct} + (1+\delta)^{-1} E(\omega_f U_{f,t+1} + \omega_m U_{m,t+1} + \omega_c U_{c,t+1})$$

The decision-maker places weight ω on each member's utility. The weights can be thought of as the outcome of a bargaining process. In a single-mother household, ω_f is set to zero, and in a single-father household, ω_m is set to zero. Future utility is discounted by δ, and E represents expectations.

Utility is a function of consumption x, and leisure, l in both periods.

$U_{it+k} = U_{it+k} (x_{it+k}, l_{it+k})$, k = 0, 1

In the model, the child lives in the household in the first period and moves out in the second period. The household decision-maker decides how much schooling the child will get in the first period through the time allocation decision. In period t+1, the leisure and consumption of the child will depend on the child's wage, w_{ct+1}, which in turn depends on the child's schooling, s. Schooling depends on the amount of time the child devoted to studying in period t, l_s.

$c_{ct+1}, l_{ct+k} = f(w_{ct+1})$

$w_{ct+1} = w(s)$

$s = s(l_{s,ct})$

The household decision maker maximizes the utility function subject to the following budget constraint:

$$\Sigma_{i=f,m,c}\, px_{it} + \Sigma_{i=f,m,c}\, w_{it}l_{it} + w_{ct}l_{s,ct} + (1+r)^{-1} (\Sigma_{j=f,m}\, px_{j,t+1} + \Sigma_{j=f,m}\, w_{jt+1}l_{jt+1}) = (1+r)A_t + \Sigma_{i=f,m,c}\, w_{it}L_{it} + (1+r)^{-1} \Sigma_{j=f,m}\, w_{jt+1}L_{jt+1} + T_{t+1}$$

The budget constraint is standard except for the T_{t+1} term, which represents any transfers from child to parent. If T_{t+1} is positive, the child transfers money to the parents, and if it is negative, the parent transfers money to the child.

Parents and the child decide how to allocate the child's time. Children can spend time in school, doing market work that may or may not be remunerated, doing household chores, or spending leisure time. In these models, changes in the price of one activity have complicated effects on other activities. A change in the market wage might increase or decrease time spent in activities besides work. The effect of a change in the market wage on schooling will depend on the elasticity of substitution between consumption goods, leisure time and time spent on household chores.

The amount of time a child spends in school is a function of the wages of parents and children, prices of consumption, expectations of future wages for educated labor, and expectations of the transfers a child will make to a parent:

$l_s = g\,[w_{it}, p, \omega_i, E(w_{ct+1}), E(T_{t+1})]$

Family structure such as the presence of a mother and the presence of a father can be thought of as affecting ω and $E(T_{t+1})$. For example, if mothers are more aware of children's needs or put a greater weight on their utility than fathers do, then children of single mothers might have higher schooling than children of single fathers do. Also, single mothers might have greater expectations that their children will support them in their old age than single fathers do, given that men have greater labor force attachment than women. This difference in expectations would lead mothers to invest more heavily in children's education than fathers would.

Increases in children's wages will have income and substitution effects. The substitution effect will increase the opportunity cost of children's schooling. If households follow a target income strategy, as found by Bhalotra, then the income effect of an increase in children's wages dominates the substitution effect, and children will work less. A neglected aspect of a current increase in children's wages is the impact on parents' expectations of their children's future wages. If parents update their expectations based on current wages, an increase in low skilled wages now implies low skilled wages will increase in the future. Parents might think that it is better for students to gain an additional year of work experience rather than an additional year of school experience.

Econometric Approach

Whether children attend school, work, or do both are the outcomes of the time allocation decisions of parents. Therefore, the decisions to attend school and to work cannot be considered independently. We estimate bivariate probit models, which make the relationship between the two decisions explicit.

The basic models are as follows:

$$A_i^* = X_i'^{p} s + Y_i d + M_{st} w + S_s + time + m_i$$
$$A_i = \begin{cases} 1 \text{ if } m_i \geq -X_i'^{p} s - Y_i d - M_{st} w - S_s - time \\ 0 \text{ otherwise} \end{cases} \quad (1)$$

$$E_i^* = X_i'^{p} f + Y_i r + M_{st} y + S_s + time + u_i$$
$$E_i = \begin{cases} 1 \text{ if } n_i \geq -X_i'^{p} f - Y_i r - M_{st} y - S_s - time \\ 0 \text{ otherwise} \end{cases} \quad (2)$$

Assume that A^* in equation (1) represents an index of the propensity of individual i to attend school. X_i represents a vector of demographic characteristics for the child and his family, including those highly correlated with permanent income such as education of the household head. Y_i represents household income and M_{st} are market conditions that are widely available to all individuals in state S at time T. S_s are constant terms representing the 25 states. m_i is a normally and independently distributed error term. A^* is treated as a latent variable and the probability of attending school is modeled as a probit such that if A^* exceeds an unobservable threshold the child is observed attending school.

Employment is assumed to be a function of the same variables. We estimate equations 1 and 2 using a bivariate probit regression, which allows us to analyze the correlation of the error terms in the school attendance and employment equations.

All of the variables are interacted with a male dummy variable. Demographic characteristics of the family include the age and gender of the child, and the education of the household head. Whether the individual is listed as the child of the head is also measured as well as whether the child's mother or father is absent from the household.[3] Since children are assumed to be secondary workers, the per capita income of the family includes only incomes of those above the age of 18. If demographic characteristics such as education are excellent proxies for permanent income, then Y will be largely reflecting transitory income. Our regressions will consider different proxies for M, the contemporaneous aggregate conditions in the local labor market that capture the opportunity costs of attending school. Primarily we consider the wages of low skilled men, represented by the average wage of men aged 30 to 35 with less than 4 years of schooling who live in state s. We also consider the wages of low skilled women as well as the state-level per capita income. Even if the wage that children actually earn is less than the unskilled wage, differences across states and over time are likely to be similar for the child wage and for the unskilled wage; we are assuming that they move in a similar fashion because they are determined by the same circumstances. The equation does not take into account state-level unemployment rates because in Brazil, unemployment is not a good indicator of macroeconomic conditions. Neri and Thomas (2000) find that transitions from employment to unemployment are equally likely to happen during boom times as during recessions, because workers can afford to search for better jobs rather than to enter into the informal sector immediately after a job loss. They note that the link between poverty and unemployment is tenuous, although it has been increasing over time.

Basic Trends

(The text and figures showing that trends in wages and child labor and schooling varies across states will be ready by the conference.)

Results *(right now just concentrating on key variables – later will elaborate other interesting results)*

Table X1 shows the results of the bivariate probit model estimation using a standard specification that omits state-level wage variables. Per capita household income (for adults) significantly raises the probability of attending school and significantly reduces the probability of being employed. This is the typical finding from micro-data – children in poorer household are more likely to be working. Extrapolating these results to declines in the macroeconomic environment suggests that children would work more in recessions, e.g., work by children/youths is ***counter-cyclical***. Table X1a presents the marginal results from this specification. A 20% increase in per capita adult income is associated with a reduction in child labor of 1.5 percentage points and an increase in the probability of school attendance by approximately 2 percentage points. Boys' schooling is slightly more responsive to the change in income than girls' schooling, but in general the marginal effects of income do not vary much by gender.

Because the identification of the change in income is coming from largely cross-sectional comparisons, one may be concerned about biases arising from unobserved heterogeneity. In other words, it is not surprising that parents with higher income are more likely to have children in school if unobservables such as tastes for education are correlated with income. So our next specification in Table X2 omits the per capita household income at the individual level and instead uses state-time variation in the wages of low-skilled males to proxy for the macroeconomic environment. Because the regressions include state level dummy variables, the changes in the unskilled wage over time within each state are used to identify the effects of opportunity costs on children's

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[3] We prefer this specification to the gender of the head because many children are living in extended families with male heads even though a father (i.e., mother's spouse) is absent from the household register.

schooling. Therefore, we are controlling for the average difference in unskilled wage across states. Barros et al. (2000) discussed the peculiar finding that children's wages had a negative effect on the probability that children would work, and argued that the wage might be picking up the differences in wealth across areas. An advantage of using several years of data is that by adding state dummy variables, the regression controls for differences in wealth across states.

An increase in the low skilled wage will increase the adults' income as well as the children's income. Even households with highly skilled adult workers experience an income effect during boom times, because good years for low skilled workers are also likely to be good for highly skilled workers. Table X2 shows that when wages rise, the probability of working increases – i.e., that youth work is ***pro-cyclical***, with girls being significantly more responsive to changes in local wages than boys. The gender differences in the estimates are striking in comparison to the first estimates. Perhaps girls and boys are treated and/or react similarly to changes in family income but respond or are treated differently with respect to labor market opportunities.

Our third set of estimations uses both the state-level wages as well as the per capita household income at the individual level. Although the other specifications merely suggested that child work was mildly pro or counter cyclical, this specification suggests that the income effect and substitution effect are both relevant for the time allocation of children. The magnitude of the state-level variables double and the magnitude of the household level income also increases. The marginal effects shown in Table X3a show the potentially offsetting effects of changes in labor market conditions. If one controls for the changes to adult family income, then children's labor market participation increases with labor market opportunities.[4] (Our results are robust to using the average wages of prime-age males as well as low-skilled females. Girls are to a larger degree

[4] Changes in household income are endogenous responses to economic shocks, because household income is a function of wages and of hours worked by adult household members. To the extent that women work in response to a negative shock, and children's time allocation is affected by mothers' time allocation, changes in household income will be endogenous to the school and child work decision. We could consider the regression without household income as a "reduced form."

more responsive than boys to the female income. The results are also robust to lowering the younger age group to 13 to 15.)

These findings suggest that all macroeconomic fluctuations are not equal. Widespread deteriorations in labor market conditions that depress family income do not appear to push children into the labor force and out of school because they appear to be offset by declining opportunity costs for children. At the same time, as parent's incomes fall, the prospects for children to raise income also fall. However, policies or shocks that disproportionately affect parents or children could have real effects on children's time use. (examples of policies – minimum wages for youth, trade shocks, ….)

We have a lot of findings related to gender but for the time being will just say that our results suggest that changes in children's time use is more gender neutral in terms of income within households than it is to changes in macroeconomic conditions.

Table X1. Bivariate Probits: Attendance and Employment
First set of regressions: without any state level wage/income variables
Pooled individual data for Children Ages 14-16, Urban Brazil
Household Surveys for: 1977, 1979, 1981, 1983, 1986, 1988, 1990, 1992, 1995, 1996, 1997, 1998

	DV: School Attendance					**DV: Employment**		
	Coeff.		S.E.	t	P>|z|	Coeff.		S.E.
constant	-29.321	*	2.944	-9.960	0.000	-7.154	**	3.238
age	-0.253	*	0.005	-50.110	0.000	0.299	*	0.007
male	-0.276	*	0.044	-6.330	0.000	0.493	*	0.047
sing. mother	-0.109	*	0.014	-7.570	0.000	0.111	*	0.014
sing. mother*male	-0.085	*	0.018	-4.630	0.000	-0.101	*	0.019
sing. father	-0.439	*	0.037	-12.010	0.000	-0.040		0.036
sing. father*male	-0.004		0.046	-0.090	0.931	0.127	*	0.044
oth. rel. of head	-0.443	*	0.020	-22.680	0.000	0.020		0.019
oth. rel. of head*male	0.087	*	0.021	4.120	0.000	0.018		0.025
schooling of hh head	0.075	*	0.003	28.480	0.000	-0.043	*	0.002
schooling of hh head*male	0.005	**	0.003	2.140	0.032	-0.013	*	0.002
log pc hh income (adults)	0.319	*	0.010	32.660	0.000	-0.238	*	0.011
log pc hh income*male	0.027	*	0.009	2.830	0.005	0.027	*	0.010
log wage low skilled								
log wage low skilled*male								
year	0.016	*	0.001	10.970	0.000	0.001	*	0.002
state variables (24)			*not shown*					*not shown*
rho	-0.386	*	0.0078					
N	211,443							
Number of clusters	300							
Wald test of rho=0	chi2(1) = 1959.89			Prob > chi2 = 0.0000				

Notes: *significant at 1%, ** significant at 10%
Huber White standard errors reported.

Table X1a Bivariate Probit without state level wage/income variable
Marginal Effects from Probit Regressions for Attendance and Employment

	Attend		**Employed**	
	Probability Attend	Change from Baseline	Probability Employed	Change from Baseline
boy				
baseline	0.724		0.466	
head more school (4 yrs.)	0.820	0.096	0.378	-0.088
20% higher income	0.745	0.021	0.451	-0.015
20% higher wages	na		na	
single mother	0.656	-0.068	0.470	0.004
girl				
baseline	0.767		0.259	
head more school (4 yrs.)	0.848	0.081	0.206	-0.052
20% higher income	0.784	0.017	0.245	-0.014
20% higher wages	na		na	
single mother	0.732	-0.035	0.296	0.037

Note: Baseline is evaluated for a 15 year old child in 2 parent home in Sao Paulo, with mean income and mean wages, and household head has mean schooling of 4 years.

Table X2. Bivariate Probits: Attendance and Employment
Second set of regressions: with state level wages, without household income
Pooled individual data for Children Ages 14-16, Urban Brazil
Household Surveys for: 1977, 1979, 1981, 1983, 1986, 1988, 1990, 1992, 1995, 1996, 1997, 1998

	DV: School Attendance			**DV: Employment**		
	Coeff.		S.E.	Coeff.		S.E.
constant	-24.033	*	3.028	-10.105	*	3.231
age	-0.237	*	0.005	0.288382	*	0.00664
male	-0.545	*	0.085	0.760	*	0.075
sing. mother	-0.204	*	0.014	0.184	*	0.013
sing. mother*male	-0.090	*	0.018	-0.098	*	0.018
sing. father	-0.383	*	0.036	-0.057		0.036
sing. father*male	0.000		0.045	0.122		0.045
oth. rel. of head	-0.425	*	0.020	0.025		0.018
oth. rel. of head*male	0.086	*	0.022	0.020		0.024
schooling of hh head	0.114	*	0.003	-0.075	*	0.003
schooling of hh head*male	0.008	*	0.002	-0.010	*	0.002
log pc hh income (adults)						
log pc hh income*male						
log wage low skilled	**-0.195**	*	**0.041**	**0.155**	*	**0.052**
log wage low skilled*male	**0.162**	*	**0.038**	**-0.074**	**	**0.034**
year	0.014	*	0.002	0.002		0.002
state variables (24)			*not shown*			*not shown*
rho	-0.412		0.008			
N	218,784					
Number of clusters	300					
Wald test of rho=0	chi2(1) = 2075.57					

Notes: *significant at 1%, ** significant at 10%
Huber White standard errors reported.

Table X2a Bivariate Probit with state level wages, without household income
Marginal Effects from Probit Regressions for Attendance and Employment

	Attend		Employed	
	Probability Attend	Change from Baseline	Probability Employed	Change from Baseline
boy				
baseline	0.764		0.419	
head more school (4 yrs.)	0.886	0.122	0.294	-0.125
20% higher income	na		na	
20% higher wages	0.762	-0.002	0.425	0.006
single mother	0.665	-0.099	0.453	0.034
girl				
baseline	0.805		0.225	
head more school (4 yrs.)	0.906	0.101	0.146	-0.079
20% higher income	na		na	
20% higher wages	0.795	-0.010	0.234	0.009
single mother	0.744	-0.061	0.284	0.059

Note: Baseline is evaluated for a 15 year old child in 2 parent home in Sao Paulo,
with mean income and mean wages, and household head has mean schooling of 4 years.

Table X3. Bivariate Probits: Attendance and Employment
Third set of regressions: with state level wages and household income
Pooled individual data for Children Ages 14-16, Urban Brazil
Household Surveys for: 1977, 1979, 1981, 1983, 1986, 1988, 1990, 1992, 1995, 1996, 1997, 1998

	DV: School Attendance			**DV: Employment**		
	Coeff.		S.E.	Coeff.		S.E.
constant	-25.175	*	2.916	-10.818	*	3.233
age	-0.254	*	0.005	0.299	*	0.007
male	-0.565	*	0.091	0.684	*	0.079
sing. mother	-0.107	*	0.014	0.109	*	0.014
sing. mother*male	-0.086	*	0.018	-0.102	*	0.019
sing. father	-0.442	*	0.037	-0.039		0.036
sing. father*male	-0.003		0.046	0.127	**	0.044
oth. rel. of head	-0.450	*	0.020	0.024		0.019
oth. rel. of head*male	0.093	*	0.021	0.014		0.025
schooling of hh head	0.073	*	0.003	-0.042	*	0.002
schooling of hh head*male	0.006	*	0.002	-0.014	*	0.002
log pc hh income (adults)	0.335	*	0.010	-0.250	*	0.012
log pc hh income*male	0.013		0.009	0.036	*	0.011
log wage low skilled	**-0.380**	*****	**0.048**	**0.300**	*****	**0.058**
log wage low skilled*male	**0.151**	*****	**0.040**	**-0.099**	*****	**0.038**
year	0.015	*	0.001	0.003	**	0.002
state variables (24)			*not shown*			*not shown*
rho	-0.384	*	0.008			
N	211,443					
Number of clusters	300					
Wald test of rho=0	chi2(1) = 2003.48					

Notes: *significant at 1%, ** significant at 10%
Huber White standard errors reported.

Table X3a Bivariate Probit: with state level wages and household income
Marginal Effects from Probit Regressions for Attendance and Employment

	Attend		Employed	
	Probability Attend	Change from Baseline	Probability Employed	Change from Baseline
boy				
baseline	0.754		0.436	
head more school (4 yrs.)	0.842	0.088	0.350	-0.085
20% higher income	0.774	0.020	0.421	-0.015
20% higher wages	0.741	-0.013	0.450	0.014
single mother	0.690	-0.064	0.439	0.003
girl				
baseline	0.794		0.235	
head more school (4 yrs.)	0.867	0.073	0.187	-0.048
20% higher income	0.811	0.017	0.221	-0.014
20% higher wages	0.774	-0.020	0.252	0.017
single mother	0.762	-0.032	0.270	0.035

Note: Baseline is evaluated for a 15 year old child in 2 parent home in Sao Paulo,
with mean income and mean wages, and household head has mean schooling of 4 years.

Table X4. Bivariate Probits: Attendance and Employment
Fourth set of regressions: with state level income, no state level wages, no household income
Pooled individual data for Children Ages 14-16, Urban Brazil
Household Surveys for: 1977, 1979, 1981, 1983, 1986, 1988, 1990, 1992, 1995, 1996, 1997, 1998

	DV: School Attendance			**DV: Employment**		
	Coeff.		S.E.	Coeff.		S.E.
constant	-25.365	*	3.062	-8.899	*	3.246
age	-0.237	*	0.005	0.288	*	0.007
male	-0.965	*	0.138	1.389	*	0.149
sing. mother	-0.204	*	0.014	0.185	*	0.013
sing. mother*male	-0.091	*	0.018	-0.100	*	0.018
sing. father	-0.383	*	0.036	-0.057		0.036
sing. father*male	-0.001		0.045	0.122	*	0.045
oth. rel. of head	-0.425	*	0.020	0.028		0.018
oth. rel. of head*male	0.087	*	0.022	0.015		0.024
schooling of hh head	0.115	*	0.003	-0.076	*	0.003
schooling of hh head*male	0.006	*	0.002	-0.008	*	0.002
log pc hh income (STATE)	-0.064		0.070	0.179	*	0.065
log pc hh inc*male (STATE)	0.147	*	0.026	-0.148	*	0.028
log wage low skilled						
log wage low skilled*male						
year	0.015	*	0.002	0.001298		0.00166
state variables (24)			*not shown*			*not shown*
rho	-0.412542		0.008			
N	218,784					
Number of clusters	300					
Wald test of rho=0	chi2(1) = 2072.81					

Notes: *significant at 1%, ** significant at 10%
Huber White standard errors reported.

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