The impact of school quality and school incentive programs on children's schooling and work in Brazil

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Abstract

During the 1990s in Brazil, school enrollment increased dramatically, while the proportion of children working fell. These trends in children's activities might be explained by increases in household income, changes in school quality such as increases in teachers' education levels, and implementation of programs that pay poor children to attend school. We use multilevel analysis to examine the impact of school quality and changes in school policy on child enrollment rates and child labor. Data from large annual household surveys, the *Pesquisa Nacional Amostra por Domicilios* covering the 1992 to 2001 period are combined with yearly data from the Ministry of Education on class size, teacher characteristics, and repetition rates, which are aggregated by urban and rural areas within Brazil's 27 states. Some policies were adopted at different times in different states, allowing us to use variation across time in an area's access to the policies to estimate their impacts.

Introduction

Recently, the policy of paying parents to send children to school has been initiated in developing countries, including Brazil, Mexico, and Bangladesh. These programs have succeeded in increasing enrollment rates. However, an important policy question is whether money spent to pay children to attend school might be better spent improving school quality. Policymakers have asked whether increased enrollments have decreased school quality. An argument can be made that investments in school quality benefit all children, whereas programs that pay children to attend school benefit poor children, possibly at the expense of poorer school quality for non-poor children. If improved school quality can pull poor children into school, it might be a win-win policy, benefiting all children.

In Brazil, school enrollment increased dramatically during the 1990s, while the proportion of children working fell. In 1992, only 68 percent of boys and 76 percent of girls aged 14 to 16 were enrolled in school. By 2001, 90 percent of boys and 92 percent of girls were enrolled in school. The increase, which occurred throughout the country, was especially impressive in the North and Northeast, the poorest regions of Brazil. In 1992, 56 percent of boys and 33 percent of girls were working, and by 2001, the proportion working had declined—38 percent of boys and 22 percent of girls were working. The high rates of male child labor in the South show that in Brazil, child labor is not exclusively driven by poverty.

During the 1990s, many factors can potentially explain the increase in enrollments and the decrease in child labor. First, Brazil's economy grew during the 1990s after the stagnation of the 1980s. Therefore, increases in family income might have increased

children's schooling and decreased child labor. Second, Brazil enacted many changes in educational policy during the 1990s, including decentralization, transferring school decision-making power to parents, and increasing teacher pay. These changes probably increased school quality. For example, average teachers' education increased during the 1990s, especially in the Northeast. Over time, a higher and higher percentage of teachers completed at least high school. Thirdly, Brazil instituted programs such as *Bolsa Escola*, which began in 1995 in Brasilia and was subsequently adopted in other municipalities. In 2001, the program became a federal program and was available throughout the country.

In our paper, we investigate the impact of income growth, changes in educational policy, and *Bolsa Escola* on school enrollment rates and child labor rates. By investigating these impacts in the same framework, we are able to compare the impact of increased school quality with the impact of school incentive programs and determine tradeoffs between programs that invest in school quality and programs that pay children to attend school.

Trends in schooling and child labor, children aged 14 to 16

Children and their families make crucial decisions about their schooling and work during the ages 14 to 16. Before age 14, more than 90 percent of children attend school and a small percentage work.

Figure 1 shows the proportion of children aged 14 to 16 who are enrolled in school, by region and by gender. School enrollments increased steadily during the 1990s. In 1992, great regional diversity existed in school enrollment, with the proportion of children enrolled in the prosperous South and Southeast exceeding the proportion of children enrolled in the poor Northeast. School enrollment rates grew faster in the

Northeast than in the South and Southeast, so regional differentials were narrowed during the 1990s. In Brazil, girls are more likely to be enrolled in school than boys. Women in recent cohorts have averaged a year more of schooling than men. Figure 1 indicates that the gender gap in school enrollments has been decreasing.

Increases in children's schooling were accompanied by decreases in the proportion of children who were working, as shown in Figure 2. The definition of working includes some forms of unpaid labor, such as work on a farm, but excludes housework. The poorest regions do not necessarily have the highest rates of child labor. For example, the South has a tradition of child labor, especially on farms. The proportion of children working is higher in the South than in the North, which is poorer. Other researchers have noted that child labor is higher in rich states than in poor ones. Barros et al. (1994) find the highest rates of urban child labor not in the cities with the highest poverty rates but instead in the higher income cities of Porto Alegre and Curitiba. Duryea and Arends-Kuenning (2003) found that child labor tends to be procyclical and is greater during times when the wage for unskilled labor is high than when the wage for unskilled labor is low. Neri and Costa (2001) looked at microeconomic and macroeconomic variables and concluded that the worst situations for children in Brazil were to live in poor families in rich regions, or to live in a family with an unemployed worker during a boom time where there was a combination of economic need and opportunities to work.

Child labor decreased in all regions during the 1990s, although regional differentials were still wide in 2001. Within each region, boys are more likely to work

than girls, which is not surprising because boys face higher opportunity costs of schooling than girls.

Brazil is a country characterized by great variation across states in children's school enrollment and work participation. We use this variation to be able to estimate the impacts of changes in school quality on children's outcomes.

Brazil's economic conditions in the 1990s

In the 1990s, high inflation was brought under control under the Real Plan implemented by Fernando Henrique Cardoso, who was then Finance Minister and later became President. The Real plan in 1994 successfully ended the high level of wage and price indexation in the economy. The Cardoso government also followed policies of trade liberalization and privatization of government industries. Investor confidence in Brazil increased and led to large capital inflows. The result was a consumption boom in 1994 and 1995 (Figure 3). Economic growth continued at a slower pace in 1996, when the tequila crisis occurred, and increased again in 1997. Observers feared that Brazil would experience a severe recession as the Asian crisis spread to other emerging markets and investor confidence waned. GDP per capita growth declined in 1998, but only by 1 percent. In 1999, GDP declined further by about 1 percent. In 2000, the economy recovered, and GDP per capita grew by 3 percent. Since 2000, GDP per capita has remained at about the same level.

The Brazilian school system

In Brazil, children officially start attending school at age 7. However, many children start later. Grades 1 to 4 are considered lower level primary, and grades 5 to 8 are upper level primary. Education statistics are reported for grades 1 to 4, grades 5 to 8

and high school, which is grades 9 to 11. The age group chosen for our study should be enrolled in grades 8 to 10 if they enrolled at age 7 and did not repeat any grades. We chose to include variables that described the quality of schooling in grades 5 to 8 because the majority of children aged 14 to 16 (59 percent) have completed grades 4 to 7 and are enrolled in those grades. The majority are behind in school. The quality of schooling in grades 5 to 8 might also have an impact on the enrollment decisions of children enrolled in lower grades. If the quality of education in grades 5 to 8 is low, families have lower incentives to encourage their children to succeed in grades 1 to 4. An additional 21 percent of children had completed education ranging from 0 to 3 years.

Data about school quality are available for public and private schools. We only examined the impact of the school quality variables for the public schools. The proportion of students who attended public schools in 1992 varied from 70 percent in the state of Rio de Janeiro to 97 percent in the state of Amapa. Therefore, quality in the public schools is going to be relevant for most families' decisions about school attendance and child labor.

Public schools in Brazil are administered at different levels of government—municipal, state, and federal. Most schools are either municipal or state. As a part of a 1996 law, responsibility for public schools was shifted to the municipal level. Because the municipality is smaller than a state, this change in policy represents decentralization.

Policy changes in the 1990s

Basic primary education became a priority in Fernando Henrique Cardoso's administration. In 1996, the Lei de Diretrizes e Bases da Educacao Nacional (Law of Directives and Bases of National Education or LDB) was passed. The law had a broad

sweep. A new institution, the Fundo de Manutencao e Desenvolvimento do Ensino Fundamental (FUNDEF) was created with the intent of changing school financing and insuring a minimum level of spending per student in each state. Resources were distributed from wealthy areas to poor areas of the country. A new program, the FUNDESCOLA, focused on the Northeast, the poorest region of Brazil. Figure 4 shows an example of resources being allocated to the Northeast. The number of 5^{th} to 8^{th} grade teachers steadily increased after 1995. From 1991 to 2001, the number of teachers almost doubled in the Northeast, compared to an increase of 41 percent in the Southeast. The LDB transferred control of funds from the federal level directly to schools and to state and municipal entities. The law also provided for data collection about school quality. (Abrahao de Castro, Rabelo Barreto, and Corbucci 2000).

The law had specific directives for teachers, which were designed to improve the quality of teaching. Requirements to be a teacher were strengthened, so that teachers had to have at least 300 hours of practice teaching before they could teach in a school. Teacher training was to be carried out as a university-level course and starting in 2006, all teachers will be required to have training at the university level or to have in-service training. The new law required periodic licensing of teachers and provided incentives for teachers to get more training. States and municipalities were required to have statutes and plans governing teachers, and the plans had to include entrance into teaching based on public examination, salary floors, and promotion based on degrees or increased qualifications and on evaluation of job performance. The 1996 legislation set a salary floor that was determined by the average cost per student per year, working 20 classroom hours and providing 5 hours of activities, with an average of 25 students per teacher

(Caiafa Salgado 1999). Figure 5 shows that teachers' wages increased dramatically between 1993 and 1995.

Bolsa Escola

Bolsa Escola is a conditional cash transfer program in which parents receive a small monthly stipend when they send their children to school. The program started at the municipal level in Campinas in Sao Paulo state and in the Federal District of Brasilia in 1995. The program spread to other municipalities and by 1999, 60 programs existed throughout the country (World Bank 2001).[2] In 2001, the program was adopted by the Federal Government. The benefit was made available to families that earned below R$90 per capita per month, an amount equal to half of the minimum per capita salary, with children aged 6 to 15 enrolled in basic primary school. Families received R$15 per month per child enrolled, up to R$45. According to the Ministry of Education of Brazil, 5.7 million families and a total of 8.3 million children were benefited by Bolsa Escola in 2002-03 (Ministerio de Educacao 2004).

The Child Labor Eradication Program (PETI)

The Child Labor Eradication Program (PETI) started in 1996 in rural areas of Brazil. By 2000, it was in 977 municipalities in 27 states and benefited 400,000. The program's purpose is to stop the worst forms of child labor, such as work in charcoal production and sugar cane. Poor families with children aged 7 to 14 receive a subsidy of R$25 per month if their children attend school, participate in after-school activities, and

[2] There are discrepancies over the number of programs. The World Bank report cites a report by Lavinas and Bittar (1999). Lavinas, Barbosa, and Tourinho (2001) stated that one hundred municipalities had adopted Brasilia's decentralized approach to minimum income programs. The Ministry of Education launched a guaranteed minimum income program in 1998 targeted to poor municipalities within states, and by 1999, the Ministry of Education claimed that 504,000 families in over a thousand municipalities were receiving a monthly stipend on average of R$37.

agree not to work. PETI is a smaller program than Bolsa Escola. We do not have data on which municipalities started PETI in which year, but in later versions of this paper, we can examine whether rural areas experienced faster growth in school enrollment and decline in child labor than urban areas.

Data

We use large, yearly household survey data sets, the *Pesquisas Nacional por Amostra de Domicilios* (PNAD), to investigate how families make decisions about children's investment in schooling and child labor. The data include extensive information about family background, parents' schooling, and household income and span the years 1992 to 2001. The Bureau of Statistics in Brazil did not collect PNAD data in 1994 and 2000, so those years are excluded. The analysis includes 8 years of data. In the PNAD data sets, work is defined to include farm work for the household's own consumption, work on the households' dwelling, as well as work for pay outside the household. This definition does not include housework. We plan to also carry out our analyses with child work definitions that include housework.

PNAD data are also used to calculate the average level of teachers' education, teachers' tenure, teachers' age and teachers' pay by urban/rural areas within states as additional measures of school quality. We chose to focus on the urban/rural areas within states because that is the smallest geographic region that is available in the public release of the PNAD data and that also matches up with the other data sets we use.

These data are combined with data available from Brazil's Ministry of Education, which include information by urban/rural area within states about repetition rates, failure rates, enrollment, students per classroom, and student-teacher ratios. These data are used

to measure school quality at the state level (by rural and urban areas) and over time. In the current version, we use the repetition rate data. We also have data about the average number of students per classroom and on average expenditure per student, but the data do not cover the entire 1992 to 2001 period. For this version of the paper, we focus on variables that we have for the entire period.

A World Bank document (2001) provides information about which municipalities started *Bolsa Escola* programs in which years. We use this data to see if states with a high proportion of the population living in municipalities that enacted *Bolsa Escola* showed significant differences in school enrollment compared to states that did not. The *Bolsa Escola* variable is not a perfect match with the PNAD data, because the programs were administered at the municipal level, but the publicly available PNAD data do not allow for identification of municipalities. So, we are aggregating the presence of the Bolsa Escola variable to the next level. We take the total populations living in the urban and rural areas of municipalities with Bolsa Escola and divide them by the total population living in urban and rural areas of the state. We expect attenuation bias to result.

These other data are matched with the individual-level survey data, allowing for a multilevel model of children's time allocation.

Research Methods

The decisions to attend school and to work are time allocation decisions, which cannot be considered independently. We estimate bivariate probit models, which make the relationship between the two decisions explicit.

The basic models are as follows:

$$A_{it}^{*} = X_{it}\delta + Y_{it}\sigma + Q_{st}\omega + B_{st}\beta + S_s + t + \mu_{it}$$

$$A_{it}^{*} = \{1 if\ \mu_{it} \geq -X_{it}\delta - Y_{it}\sigma - Q_{st}\omega - B_{st}\beta - S_s - t$$

$$A_{it}^{*} = \{0 otherwise$$

$$E_{it}^{*} = X_{it}\phi + Y_{it}\rho + Q_{st}\gamma + B_{st}\eta + S_s + t + \upsilon_{it}$$

$$E_{it}^{*} = \{1 if\ \upsilon_{it} \geq -X_{it}\phi - Y_{it}\rho - Q_{st}\gamma - B_{st}\eta - S_s - t$$

$$E_{it}^{*} = \{0\ otherwise$$

A^* represents an index of the propensity of individual *i* to attend school. X_{it} represents a vector of demographic characteristics for the child and his or her family such as education of the household head. Y_{it} represents household income, and Q_{st} represent the school quality available to children in state *S* at time *T*. S_s are constant terms representing the rural and urban areas in Brazil's 27 states. μ_{it} is a normally and independently distributed error term. The probability of attending school is modeled as a probit such that if A^* exceeds an unobservable threshold the child is observed attending school. E^* represents an index of the propensity of individual *i* to work outside the home, and the same variables that determine *A* also determine *E* because both are time allocation decisions. The bivariate probit approach allows for correlations between μ_i and υ_i.

The constant terms representing urban and rural areas within states allow us to control for unobservable characteristics of states that might be correlated with school quality and with children's school attendance and employment. By pooling several years of the PNADs, we are identifying the effects of school quality from the differences in school quality within geographic regions over time. This eliminates bias that may result from omitted state-level variables.

To evaluate the impact of *Bolsa Escola*, we include a measure of the percentage of people within an area who lived in a municipality with Bolsa Escola.

Brazil had high repetition rates. Poor children who were behind the correct grade-for-age were likely to drop out when they became adolescents. Brazil has changed its education policy to reduce repetition rates by relaxing guidelines for passing grades. Figure 6, based on data from the Ministry of Education, shows the decline in failure rates during the 1990s. For example, in the Northeast, 23 percent of fifth to eighth graders failed the grade. By 2001, the failure rate fell to 14 percent. We include the repetition rate lagged by one period to determine examine whether policies like reducing repetition rates and moving to social promotion have contributed to increasing school attendance and decreasing child labor.

Because *Bolsa Escola* started in 1995, we add a variable to control for observations from 1995 or later. School policy became a priority in the mid 1990s, and this variable controls for shifts in demand for schooling and supply of schooling that are not controlled for in the regressions.

In all the regressions, we correct the standard error estimates for clustering of unobservable characteristics within geographic areas using the "robust cluster()" command in STATA.

Description of the sample

Table 1 shows the sample means and standard deviations pooling all the data, whereas Table 2 presents the statistics for 1992 and 2001 in order to examine changes that have occurred over time. Focusing on Table 2, we see that the proportion of children aged 14 to 16 enrolled in school increased from 76 percent to 92 percent, and the percentage working decreased from 34 percent to 25 percent. Mothers and fathers have low levels of education (4.7 years for fathers and 4.6 years for mothers in 1992), although fathers gained a half year of education and mothers gained almost a whole year between 1992 and 2001. Given the strong relationship of parental education to children's schooling, the increase in parents' education played an important role in increasing children's school enrollment. Deflated household income more than doubled between 1992 and 2001.

The data show the improvements in school quality that occurred during the 1990s. Repetition rates fell from .24 to .12 as schools moved towards a norm of social promotion. Deflated teachers' wages more than doubled. The average age of teachers increased slightly, while the average tenure of teachers in a school fell by almost 5 months. For students in grades 5 to 8, the average schooling of teachers decreased slightly as new teachers were hired. In poor regions, most of the new teachers that were hired had high school degrees rather than higher education degrees. The most remarkable changes in teacher quality happened at the level of grades 1 to 4, where, for example, in

the Northeast, the proportion of teachers with incomplete primary fell from 20 percent to less than 3 percent from 1992 to 2001. In 1992, 30 percent of the grade 1 to 4 teachers had less than high school education; by 2001, that percentage had fallen to 10 percent.

Results

The results of the bivariate probit model are presented in Tables 3 and 4. Table 3 presents the results for school attendance and Table 4, for child labor. Model 1 shows results obtained excluding dummy variables for the state-urban/rural region and Model 2 shows results including the full set of dummy variables. The estimate of rho is highly significant in both models, suggesting that decisions to attend school and work are strongly related.

Looking at the decision for children to attend school, at the individual level, all the variables have the expected signs and are highly statistically significant. Mothers' education has a greater effect on children's school enrollment than fathers' education, and this difference is highly statistically significant at all levels of schooling. Girls are more likely to be enrolled than boys. Children are less likely to be enrolled in school as they get older. Household income has a positive and highly significant impact on children's school enrollment. The results are very similar across Model 1 and Model 2, suggesting that unobservable characteristics that vary by areas are not highly correlated with the individual-level variables and school enrollment.

The previous year's repetition rate has a negative and highly significant impact on the probability that a child will enroll in school when the urban/rural state dummy variables are added to the regression, although the variable is not significant when the dummy variables are omitted. One interpretation of this increase in magnitude is that

areas that experienced the largest falls in repetition rates were areas where children were less likely to be enrolled in school. High repetition rates are correlated with school dropout. As children repeat grades and are in classrooms with younger children, they get discouraged and drop out of school. Therefore, social promotion seems to have achieved its purpose in increasing enrollment.

Teachers' characteristics have an impact that is marginally statistically significant on children's school enrollment in Model 1, but the statistical significance of these characteristics are not robust to adding the urban/rural state dummy variables. The proportion of teachers who have a second job is hypothesized to have a negative impact on children's schooling because teachers who have second jobs may not have as much energy to devote to teaching as teachers who have only one job. This variable was not significant, however. Teachers' wages have a positive, but insignificant impact on school enrollment. Caiafa Salgado argues that the changes in the 1996 law helped teachers' morale and helped improve the communities' perceptions of teachers as professionals, but we find no evidence to support this argument here. The teachers' average age has a positive and marginally significant impact on children's school enrollment, but the result is not robust to adding the area dummy variables. As teachers' average tenure in the school increases, school enrollment decreases. This result becomes statistically insignificant in Model 2. A possible interpretation of the result is that new teachers are better qualified to teach than older ones who have been in the job for a long time. Standards for hiring teachers have been increasing. Therefore, areas where greater numbers of new teachers have been hired show greater growth in school enrollment. We

saw that the highest percentage growth in the number of teachers hired occurred in the Northeastern and Northern states.

Average teachers' education is found to have no significant effect on children's school enrollment, unlike previous studies. Barros, Mendonca, Dos Santos, and Quintaes (2001) found that teachers' education at the 5th to 8th grade level had a positive impact on children's school attainment. Albernaz, Ferreira, and Franco (2002) found that teachers' education had a significant and positive impact on 8th grade students' achievement test scores.

Looking at the impact of living in an area with *Bolsa Escola*, we find that the effect is positive and highly significant in Model 1, and the effect is diminished in magnitude, but remains highly significant when the dummy variables are added. One interpretation of the result is that areas that had *Bolsa Escola* were areas where children had unobservable characteristics that made them more likely to attend school. Adding the dummy variables lowers the magnitude of the estimated impact of *Bolsa Escola* and attributes it to the fixed effects instead. Another interpretation is that more progressive municipalities adopted the program, and those municipalities may have been doing other programs and policies, which we do not observe, that impacted school enrollment. Again, having to match PNADs with the *Bolsa Escola* information at the state-urban/rural area will lead to some attenuation bias because *Bolsa Escola* was administered at the municipal level.

Looking at children's work in Table 4, the individual level variables all have the expected signs and are highly significant. Mothers' and fathers' education have about equal impact on the probability that a child will work, with the difference between fathers

and mothers having completed primary statistically significant at the 5 percent level. Girls are less likely to be reported as working than boys. The probability that a child will work increases with age. Finally, the probability that a child will work decreases as household income increases. The magnitude of the effect increases when the state-urban/rural variables are added to the regression. Therefore, areas where a higher percentage of children work tend to have higher income than areas where a lower percentage of children work.

School quality variables have strong impacts on the probability that a child will work. The repetition rate has a negative and significant impact on the probability that a child will work in Model 1, but the effect switches signs and is statistically significant in Model 2. Therefore, within a state urban/rural region, as repetition rates fall, children are less likely to work. Teachers' wage has no significant impact on child labor in either model. As tenure of teachers increases, children are more likely to work, but the result is only statistically significant in Model 1. Education of teachers has a negative and marginally significant impact on child labor in Model 1, but the result becomes insignificant when the state urban/rural dummies are added. Tenure of teachers has a positive and significant impact on child labor in Model 1, but the effect is not significant in Model 2. Therefore, none of the teachers' variables has a significant impact on child labor once the state urban/rural dummies are added.

Finally, *Bolsa Escola* has a negative and statistically significant impact on the probability that a child is working, although the magnitude of the effect is cut by about 40 percent when the area dummy variables are added. Two other studies of the impact of *Bolsa Escola* on child labor found no significant effect of the program on child labor.

Cardoso and Souza (2003) used the 2000 Census and found that the program affected school enrollment, but had no significant impact on child labor. Ferro and Kassouf (2003), using the 2001 PNAD, found no significant impact of *Bolsa Escola* on the probability that a child would participate in work, but found a negative and significant effect on the number of hours worked. One reason why our results may be different is that we are using a pseudo panel, whereas the other two studies used single cross sections. *Bolsa Escola* appears to have a strong impact on child labor, although the program does not explicitly require that children stop working to receive benefits. Another interpretation is that areas with *Bolsa Escola* were the areas where social norms about child labor were changing most rapidly. Programs that improve school quality and encourage school attendance have a significant role to play in reducing child labor.

Simulation results

Table 5 presents the results from a simulation for selected variables. The coefficient values come from Model 2 of Tables 3 and 4. We set the value of each variable of interest at a baseline value, changing only one variable at a time. We then calculate predicted probabilities for the categories work and school, work only, school only, and neither. Next, we change the value of the variable of interest to a new value and then calculate predicted probabilities for the four categories again. For example, Table 5 shows that children who have fathers who have no schooling have a probability of .23 of being in work and school, .56 of only attending school, 12 of only working, and .07 of doing neither.

Table 2 indicates that 14 to 16 year old children increased enrollment rates from .76 to .92 and decreased the proportion working from .34 to .25. These are the changes that we try to explain.

The magnitudes of the impact of parental schooling on the outcomes are large. Children whose fathers have some primary schooling have a predicted probability of .84 of attending school and .31 of working. Children whose fathers have completed primary schooling (through grade 8) have a predicted probability of .89 of attending school and .25 of working (adding together the columns work and school with school only and also work and school and work only). For mothers' schooling, children who have mothers who completed some primary schooling have a predicted probability of .84 of attending school and .31 of working, whereas children who have mothers who completed primary have a predicted probability of .91 of attending school and .27 of working. (To be done--determine how much of the change we can explain by the changes in parents' education between 1992 and 2001.)

The impact of income is not large in magnitude, and can only explain 2 percentage points of the increase in children's school attendance rates. Children have a probability of .83 of attending school when the 2001 monthly income is 510 reis and a predicted probability of .85 of attending school when income almost doubles to 1,060 reis.

Bolsa is also shown to have a small effect. Doubling the percentage of the population that lives in an area with Bolsa increases the probability of attending school from .84 to .86 and lowers the probability of working from .30 to .29. Again, this estimate is a lower bound for the true estimate, because of attenuation bias.

Finally, the repetition rate also has a small impact on children's school attendance and child labor. The fall n the repetition rate from .24 in 1992 to .12 in 2001 is estimated to have increased the predicted probability of school attendance from .82 to .85 and to lower the probability of working from .32 to .30.

Conclusions

In this study, we use 8 years of household survey data from Brazil and match it with data from the Ministry of Education to investigate the impact of school quality, household variables, and school programs on children's school enrollment and child labor for children aged 14 to 16. The school quality and school programs variables are aggregated to the level of the urban or rural areas with Brazil's 27 states. By using many years of data, we can add controls for geographic area and identify the effects of school quality variables from changes over time within states. We find that when we control for geographic area, some of the school quality variables, notably the repetition rate and the average education of teachers, change signs and/or significance.

The teachers' quality variables do not have significant effects on children's schooling and child labor once we control for urban/rural areas within states. Repetition rates are found to have strong impacts on children's decisions to enroll in school and to participate in child labor.

We identify the effects of a conditional cash transfer program, *Bolsa Escola*, on children's school enrollment and child labor by examining the impact of living in an area where a high proportion of the population is covered by *Bolsa Escola*. Keeping in mind that the program was available at the municipal level, but the data only allow aggregation at the level of urban-rural areas within states, our results are subject to attenuation bias.

We find significant positive effects of having a *Bolsa Escola* program on school enrollment rates. Our findings are novel in that we find significant negative effects of *Bolsa Escola* on the probability that a child is working.

The magnitude of the effects that we estimate for Bolsa and for repetition rates are small, and explain only a fraction of the increase in child enrollment and the decrease in child labor that occurred between 1992 and 2001.

For future analysis, we plan to use more of the school quality variables that we have available, such as spending per student, which is available for fewer years. We intend to look at whether the effects of the school quality variables vary by gender and by socioeconomic group. Finally, we plan to look at the impact of the school quality variables and Bolsa Escola on the probability that a student is enrolled in the proper grade for age.

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Table 1. Means and standard deviations for variables used in bivariate probit analysis, children aged 14 to 16, Brazil, 1992 to 2001

Variables	Mean	Standard Deviation
Dependent variables		
Enrolled in school	0.83	0.37
Working	0.30	0.46
Individual-level variables		
Father's education		
No education	0.23	
Some primary	0.51	0.50
Completed primary	0.10	0.30
Completed secondary	0.16	0.37
Mother's education		
No education	0.19	
Some primary	0.53	0.50
Completed primary	0.11	0.31
Completed secondary	0.17	0.37
Gender=female	0.48	0.50
Age	14.96	0.81
Household income, adults over 18 (in '000s)	0.97	1.66
School quality variables (urban/rural areas within states, grades 5 to 8)		
Average repetition rate	0.17	0.08
Proportion of teachers who have a 2nd job	0.23	0.15
Average deflated teachers' wage	0.02	0.01
Average age of teachers	36.00	4.17
Average tenure of teachers, in months	40.81	16.55
Average education of teachers	13.21	1.48
Percentage of population within urban/rural area within state that lives in a municipality with a bolsa escola program	0.17	0.35
N	111,499	

Table 2. Means and standard deviations for variables used in bivariate probit analysis, children aged 14 to 16, Brazil, 1992 and 2001

	1992		2001	
Variables	**Mean**	**S.D.**	**Mean**	**S.D.**
Dependent variables				
Enrolled in school	0.76	0.43	0.92	0.28
Working	0.34	0.47	0.25	0.43
Individual-level variables				
Father's education	4.72	4.44	5.24	4.44
No education	0.24		0.21	
Some primary	0.51	0.50	0.48	0.50
Completed primary	0.09	0.29	0.12	0.33
Completed secondary	0.16	0.36	0.19	0.39
Mother's education	4.58	4.17	5.56	4.31
No education	0.23		0.17	
Some primary	0.53	0.50	0.50	0.50
Completed primary	0.09	0.29	0.13	0.33
Completed secondary	0.15	0.36	0.20	0.40
Gender=female	0.48	0.50	0.47	0.50
Age	14.95	0.81	14.97	0.81
Household income, adults over 18 (in '000s)	0.51	0.80	1.06	1.91
School quality variables (urban/rural areas within states, grades 5 to 8)				
Average repetition rate	0.24	0.05	0.12	0.05
Proportion of teachers who have a 2^{nd} job	0.27	0.19	0.21	0.13
Average deflated teachers' wage	0.01	0.00	0.02	0.01
Average age of teachers	36.35	3.83	36.82	4.80
Average tenure of teachers, in months	43.53	18.47	38.50	14.23
Average education of teachers	13.55	1.28	13.43	1.22
Percentage of population within urban/rural area within state that lives in a municipality with a bolsa escola program	0.00	0.00	1.00	0.00
N	16,259		15,040	

Table 3. Bivariate probit, school attendance results, children aged 14 to 16, Brazil, 1992 to 2001

	Model 1		Model 2	
Variable	**Coefficient**	**S.E.**	**Coefficient**	**S.E.**
Dependent variable: school attendance				
Individual-level variables				
Father's education				
Some primary	0.227***	0.02	0.244***	0.02
Completed primary	0.505***	0.03	0.494***	0.03
Completed secondary	0.672***	0.04	0.657***	0.04
Mother's education				
Some primary	0.317***	0.02	0.331***	0.02
Completed primary	0.751***	0.03	0.727***	0.03
Completed secondary	0.981***	0.03	0.952***	0.03
Gender=female	0.248***	0.02	0.254***	0.02
Age 15 (14 is omitted)	-0.259***	0.01	-0.267***	0.01
Age 16	-0.478***	0.01	-0.492***	0.01
Household income, adults over 18	0.144***	0.02	0.152***	0.02
School quality variables (urban/rural areas within states, grades 5 to 8)				
Average repetition rate	0.080	0.34	-1.490***	0.30
Proportion of teachers who have a 2nd job	-0.069	0.11	0.028	0.09
Average deflated teachers' wage	-4.127	3.95	-0.893	2.15
Average age of teachers	0.012**	0.01	-0.003	0.00
Average tenure of teachers, in months	-0.003**	0.00	-0.001	0.00
Average education of teachers	-0.003	0.02	0.008	0.01
Percentage of population in urban/rural area within state that lives in a municipality with a bolsa escola program	0.345***	0.03	0.266***	0.03
Local labor markets—hourly wage for low-skilled workers in area	13.275	45.17	-47.690	43.68
After 1995	0.282***	0.07	0.199***	0.07
Dummy variables for urban/rural area within state included?	No	No	Yes	Yes
Log likelihood	-100402.65		-97576.86	
N	111,499		111,499	

Significant at * $p \leq 0.10$; ** $p \leq 0.05$; *** $p \leq 0.01$.
Standard errors are corrected for clustering of observations within urban/rural areas of states.

Table 4. Bivariate probit, child labor results, children aged 14 to 16, Brazil, 1992 to 2001

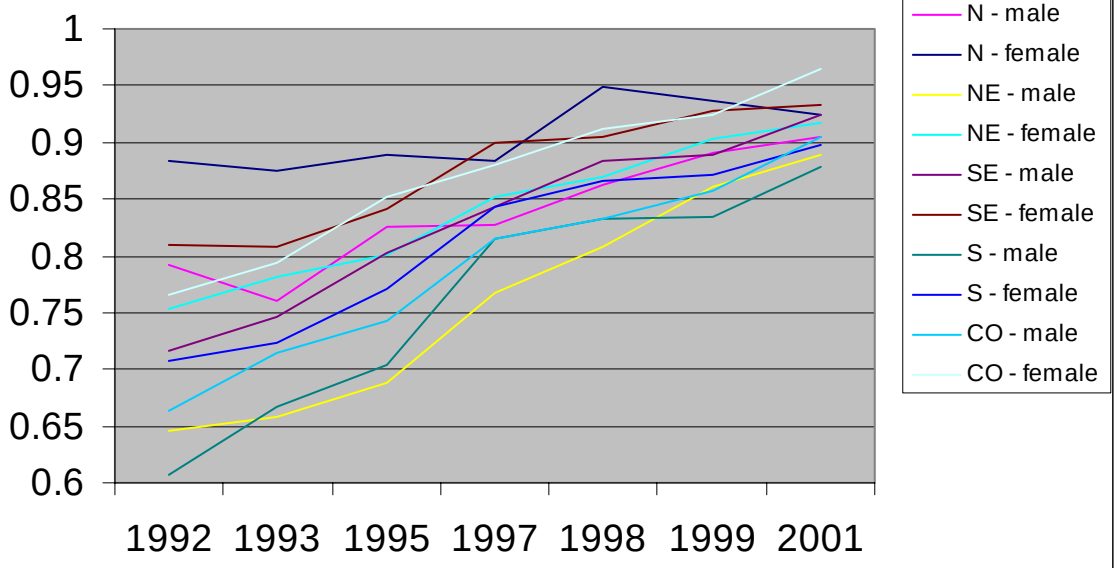
	Model 1		Model 2	
Variable	**Coefficient**	**S.E.**	**Coefficient**	**S.E.**
Dependent variable: child working				
Individual-level variables				
Father's education				
Some primary	-0.135***	0.02	-0.128***	0.01
Completed primary	-0.395***	0.03	-0.342***	0.03
Completed secondary	-0.553***	0.03	-0.495***	0.02
Mother's education				
Some primary	-0.133***	0.02	-0.133***	0.02
Completed primary	-0.321***	0.03	-0.271***	0.03
Completed secondary	-0.521***	0.03	-0.460***	0.03
Gender=female	-0.576***	0.03	-0.595***	0.03
Age 15 (14 is omitted)	0.234***	0.02	0.248***	0.02
Age 16	0.447***	0.04	0.471***	0.04
Household income, adults over 18	-0.027***	0.01	-0.037***	0.01
School quality variables (urban/rural areas within states, grades 5 to 8)				
Average repetition rate	-1.666***	0.51	0.611***	0.17
Proportion of teachers who have a 2nd job	0.213	0.14	-0.011	0.05
Average deflated teachers' wage	-5.536	3.69	-2.773	2.72
Average age of teachers	-0.020***	0.01	0.002	0.00
Average tenure of teachers, in months	0.003**	0.00	0.001	0.00
Average education of teachers	-0.033*	0.02	0.008	0.01
Percentage of population in urban/rural area within state that lives in a municipality with a bolsa escola program	-0.187***	0.05	-0.111***	0.02
Local labor markets—hourly wage for low-skilled workers in area	-96.468	59.98	18.554	135.84
After 1995	-0.058	0.07	-0.078**	0.04
Dummy variables for urban/rural area within state included?	No	No	Yes	Yes
Rho	-0.317***	0.02	-0.284***	0.02
Log likelihood	-100402.65			
N	111,499		111,499	

Significant at * $p \leq 0.10$; ** $p \leq 0.05$; *** $p \leq 0.01$.
Standard errors are corrected for clustering of observations within urban/rural areas of states.

Table 5. Simulated predicted probabilities for children's school attendance and child labor (based on Model 2)

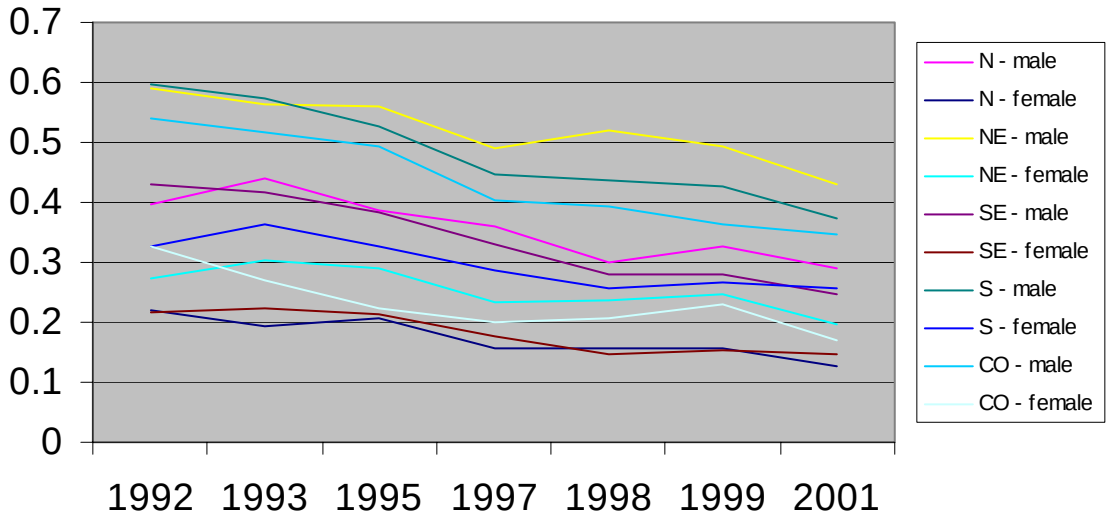
	Work and School	School Only	Work Only	Neither
Father no schooling	0.23	0.56	0.12	0.09
Father some primary	0.22	0.62	0.09	0.07
Father completed primary	0.19	0.70	0.06	0.05
Father completed secondary	0.17	0.75	0.04	0.05
Mother no schooling	0.21	0.54	0.13	0.11
Mother some primary	0.22	0.62	0.09	0.07
Mother completed primary	0.22	0.69	0.05	0.04
Mother completed secondary	0.19	0.75	0.03	0.03
2001 real monthly income = 510 reis	0.21	0.62	0.09	0.07
2001 real monthly income = 1,060 reis	0.21	0.64	0.08	0.07
25 percent of population lives in municipality with Bolsa Escola	0.21	0.63	0.09	0.07
50 percent of population lives in municipality with Bolsa Escola	0.21	0.65	0.08	0.06
Repetition rate for grades 5 to 8 is 24 percent	0.21	0.61	0.11	0.08
Repetition rate for grades 5 to 8 is 12 percent	0.21	0.64	0.09	0.06

Figure 1: School enrollment, Brazilian Children aged 14 to 16, 1992 to 2001 by region and gender

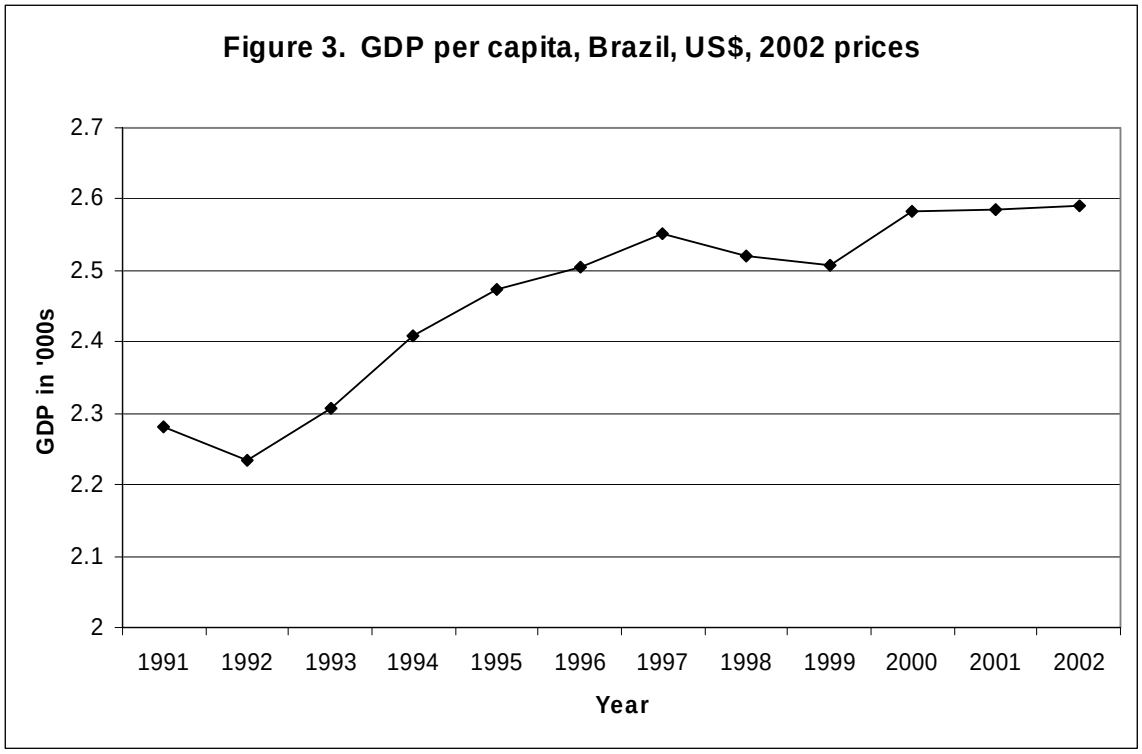


Source: PNAD data sets

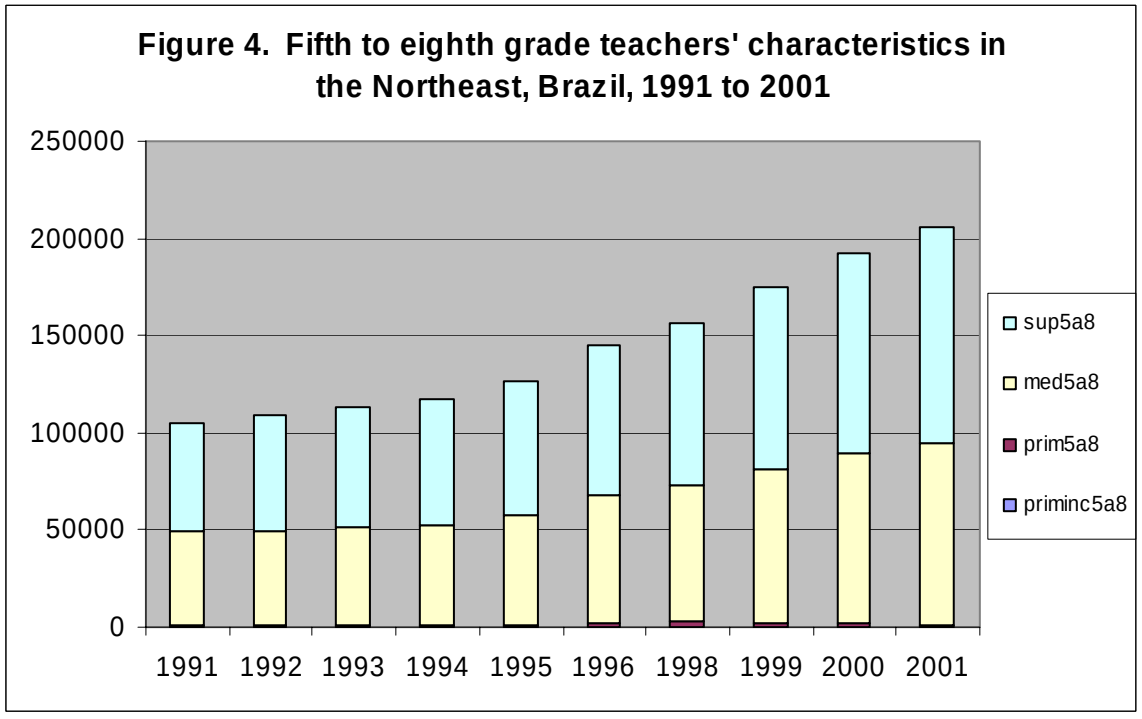
Figure 2. Proportion of Brazilian children who are working, 1992 to 2001, by gender and region



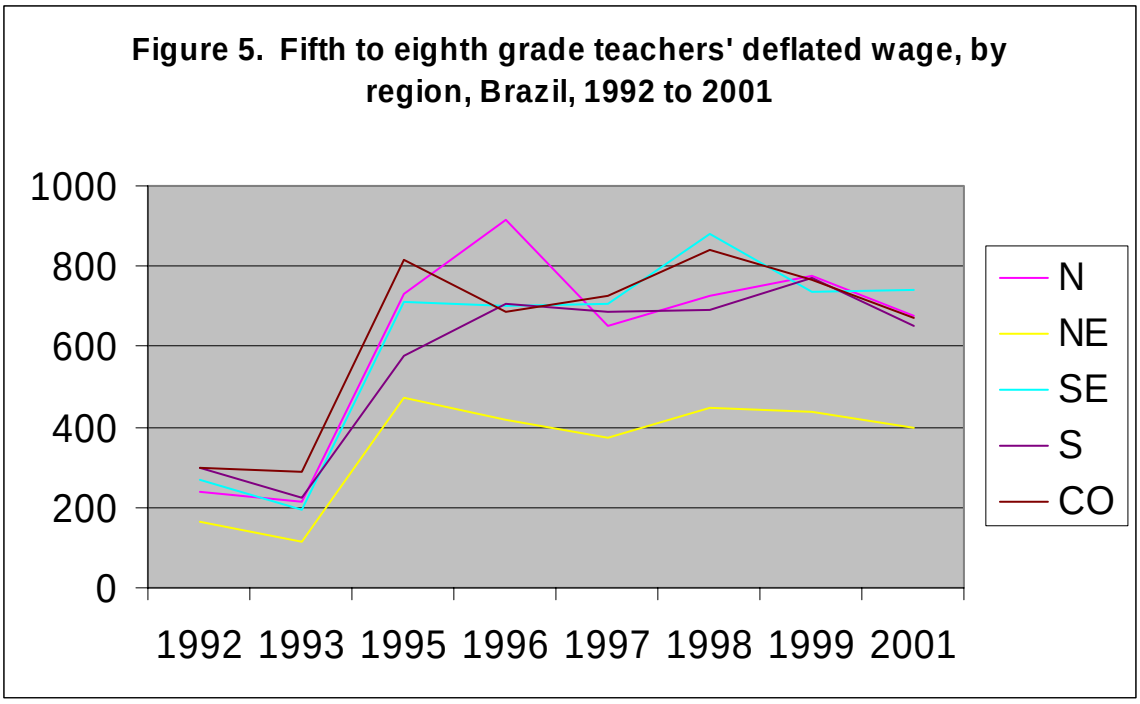
Source: PNAD data sets



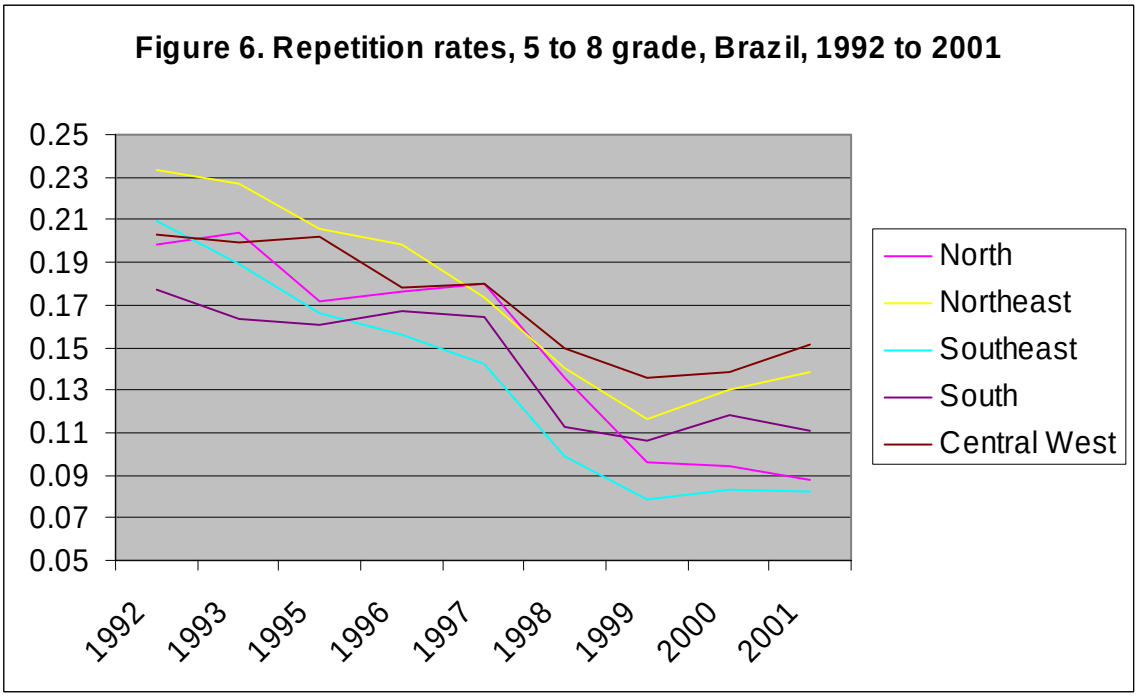
Source: IPEA, frequently requested series



Source: Ministry of Education, Brazil



Source: Ministry of education, Brazil



Source: Ministry of Education, Brazil