School Quality: Is Quantity Only Enough to Explain Educational Inequalities in Brazil?

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Abstract

Despite recent improvements in educational levels, Brazil shows persisting high levels of schooling inequality and dissimilarity between appropriate age and grade. One key component that has been left out on most studies on education in developing countries has been the systematic disentanglement of all barriers to education faced by children and adolescents: individual, school, and place of residence levels. The goal of this paper is to investigate the impact of school quality on years of schooling and age-grade correspondence in Brazil. Based on nationally representative individual-level data merged with school censuses from 1997 and 2001, we estimate ordinary linear and logistic models of schooling and probability of age-grade correspondence for several age groups – ages 7 to 10, 11 to 14 and 15 to 18. We next estimate hierarchical linear models to account for variation at both the individual and school urban/rural state levels.

Introduction

One of the most important demographic trends of the 20th century was the secular increase in levels of formal education. Despite overall improvements in educational levels, schooling has been distributed unequally across and within populations, and the benefits it generates are confined to few. The unequal distribution of education, both in terms of quantity and quality has contributed to and maintained social, economic, demographic and health inequalities. One key component that has been left out on most studies on educational attainment in developing countries has been the systematic disentanglement of the sources of such inequity in distribution of schooling. The barriers to education faced by children and adolescents may stem from numerous sources and can be at the individual, family, school and regional levels, such as access to fewer and poorer-quality educational facilities because of residence in poorer places as well as living in households without the resources to support schooling, to name a few. The existing literature on education disparities in developing countries, while highlighting problems of access, rising costs, and increasing incentives for pulling children from school, has not sufficiently focused on disentangling all these dimensions of the problem. The goal of this paper is to expand this literature by addressing the impact of quality of schools on educational outcomes in Brazil. We will address whether and how school characteristics explain inequities in age-grade gap and educational attainment. We ask: Do school characteristics explain inequities in educational attainment of Brazilian children and adolescents? How do these effects differ by age? How do individual and family level factors explain schooling when supply factors are included? We are particularly interested in how quality measures – availability of library and computer and science labs -- affect schooling and age-grade correspondence in rural and urban Brazilian states.

Literature Review

Brazil's educational system has produced low levels of education and an unequal distribution of schooling (Barros and Lam 1996; Lam and Levison 1991). Brazil has had disappointing performance in its educational system in recent decades, with both the level and the rate of growth of mean schooling lagging behind other countries with similar levels of per capita income (Birdsall and Sabot 1996). The country's poor educational performance has raised several works about how such low levels of educational attainment are generated and reproduced (Lam and Levison 1991; Birdsall and Sabot 1996; Marteleto 2002; Barros and Lam 1996) .

This paper utilizes different pools of literature on educational stratification, including research on school effects, which examines whether and how availability and quality of schools relate to achievement and works on the effects of poverty on schooling. We draw on each of these bodies of work to determine whether together they provide a more comprehensive explanation of children and adolescents' educational attainment process and its sources of inequity than do more common approaches based solely on individual-level characteristics.

The status attainment model documents the positive relationship between socioeconomic background and educational achievement, and was later expanded in the Wisconsin model to illustrate the positive effects of educational aspirations and expectations on educational attainment (Blau and Duncan 1967; Sewell 1971). To improve upon the analysis of individual-determinants of education, the school-effects literature claims that educational attainment is not simply the result of resources and individual effort, but it is also the product of quality of schools (Hannum 1999; for a review, see Buchman and Hannum 2001). Lastly, the poverty literature argues that access to schools also determines educational outcomes (Massey and Denton 1993). The importance of regional- and school-level influences for educational inequalities has been posited, but only rarely empirically demonstrated in developing nations.

The interaction between regional residence and poverty creates distinctly disadvantaged areas characterized by educational shortages, difficulty in access of and poor quality schools. The highly disparate regions in Brazil are marked by differentials in the availability of schools, as well as the quality of education provided. For example, in 2001 47% of the schools of 1st to 4th grade in the South region had a library, while this percentage was 9,8% in the North region. These figures suggest that constraints associated with region of residence contribute to the poor schooling levels observed among children in North and Northeast states. Do school factors at the regional level influence schooling outcomes net of individual-level characteristics? Barriers to education in developing countries have been broadly categorized into supply-side issues related to income and school availability and quality and demand-side issues related to household poverty and the direct and opportunity costs of education. The addition of regional-level measures of school quality will show whether and how barriers to school access and quality are relevant determinants of age-grade gap and years of schooling. By systematically accounting for the roles and influences of family, school and community characteristics in conditioning access to

and progress in schooling, this research provides a more comprehensive portrait of the educational process in Brazil.

Schooling measures from cross-sectional surveys show sharp distinctions between children identified as enrolled and not enrolled in school at the time of the survey, but these data are not designed to measure true school transitions as they capture only a snapshot of children's educational attainment. These distinctions are potentially misleading for the larger group of children who do not necessarily attain a year of education because of school dropout and grade repetition.

Given recent cohorts' near universal school enrollment in first grade, future improvements in educational attainment in Brazil must occur through maintaining children enrolled in school and school quality for future improvements beyond first grade. The major goal of this paper is to disentangle such puzzle of high enrollment rates combined with persistent low levels of schooling by analyzing age-grade gap and years of schooling accounting for more dimensions of the process of educational attainment: supply – region and school -- and demand – individual and family -- factors.

Are children from areas of low school quality at an educational disadvantage, net of individual-level variables? We will address whether and how school, socio-economic and demographic characteristics measured at the regional level affect children and adolescents' schooling in Brazil. The results will indicate the extent to which states and areas with lower school quality explain the poor educational performance of children and adolescents in these areas. Similarly, the results will show whether the effects of social origin on educational outcomes decrease after aggregate school quality measures are introduced. Past research suggests that even if children in the poor Northeast had parents with the high levels of education as children in the developed Southeast, they would not have higher levels of schooling (Marteleto 2002). This suggests the importance of issues of school quality and regional socio-economic in explaining Brazil's low levels of schooling and high educational disparities.

In spite of the recognized importance of schooling for better socio-economic and demographic outcomes in developing countries, very little is known about how demand and supply factors interact and together condition educational attainment. Given the near universality of first grade enrollment for cohorts born after the late 1980s in Brazil, the task for significant future increases in schooling must occur through maintaining children in schools and decreasing

age/grade mismatch. By systematically accounting for the roles and influences of family, school and community characteristics in conditioning access to and progress in schooling, this research provides a more comprehensive portrait of educational stratification in Brazil.

Data, Variables and Methods

Data

In order to fully assess the impact of availability and quality of schools on adolescents' school transitions, we merge data from the *Censo Educacional* (Brazilian Educational Census) with nationally representative PNAD.

In this paper we use data from the 1997 and 2001 *Pesquisa Nacional por Amostra de Domicílios*/PNAD (National Research of Household Sample), annual household surveys conducted by the *Instituto Brasileiro de Geografia e Estatística* (IBGE), the Brazilian statistical bureau. The PNAD survey gathers standard demographic, schooling, labor force, and earnings information for each household member age 5 and older, and is comparable with the U.S. Current Population Survey (CPS), and is implemented in September of each year.

The PNAD is a nationally representative survey of extremely good quality. For 1997, the PNAD contains 365,870 individuals in 67,354 households, compared to 374,088 individuals in 65,495 households in 2001. The PNAD is appropriate for this study because it contains standard demographic and socio-economic variables such as sex, age, income, and schooling for all members of the household. Another feature of the PNAD that makes it suitable for this study is that the repeated cross-sections allow for comparisons over time. Data from 1997 and 2001 are comparable, with the exception of information on race and ethnicity that was not collected in 1981, making it impossible to compare ethnic distributions. Also note that the PNAD covers the rural part of only one state the Northern region in 1981 or in 2001. This probably overestimates the educational and socio-economic statistics of the Northern region.

In order to measure the effects of school quality, we use data from the Brazilian 1997 and 2001 School Census, aggregating information at the rural/urban and state levels. The Brazilian Ministry's of Education Institute, INEP (National Institute for Education Studies an Research) collects annual information from all private and public schools in the country since 1995. INEP produces estimates of availability and quality of all Brazilian schools, such as information about teacher's education, class size, hours of class instruction, existence of computer laboratories,

library, among many others. For example, in 2001 the School Census contains information about 218,383 schools, being 167,209 of 1st to 4th grades, 51,091 of 5th to 8th grades and 19,221 of 9th to 11th grades.

Variables

Brazil's current educational system is formed of primary and secondary schools. Primary education is divided into a lower and an upper level each of four years' duration. Basic primary education consists of 1st to 4th grades; the upper level of primary education consists of 4 more grades, from 5th to 8th grades. Both parts of primary education are compulsory. Secondary education consists of a single non-compulsory level of three years, from grade 9th to 11th. The appropriate ages that correspond to these grades in the Brazilian educational cycles are ages 7 to 10, 11 to 14 and 15 to 18. We will develop models for children in each of these three groups.

The compulsory nature of primary education in Brazil is not effective in practice, however. Gaining education in Brazil involves a sequence of several critical transitions. Once a student is enrolled in a particular level it is not certain that he or she will complete that level. Grade retention and drop out rates are characteristics of the Brazilian educational system, which create high levels of gaps between appropriate age and grade enrolled or attained.

According to these characteristics of the Brazilian educational system we elaborated indicators at the individual and regional level with the goal of analyzing the factors that influence children and adolescents' educational results. The age-grade gap indicator was built based on two items: completed years of schooling and age. It is constructed by dividing the completed years of schooling by current age minus 7, the appropriate and mandated age for starting school. For example, a child who started school at appropriate age 7 and advanced a grade each year without repeating a grade or dropping out of school should be on 7th grade at age 14. This child would therefore have an age-grade indicator of 1, meaning that her grade attained corresponds to her age. On the contrary, when the indicator is less than 1 means that the child has an educational gap. This measure takes age into account, which allows for comparisons across ages. Note that our goal is not to measure the extent of the gap but investigate whether it exists or not. Our second dependent variable will be completed years of schooling.

To measure school's quality, the following items were considered: proportion of schools with library, science and computer lab. These measures are at the state and rural/urban levels,

totaling 46 regional levels of investigation for each year – 1997 and 2001. We will add socio-economic measures at these levels. Children's family and individual characteristics are mother's years of schooling measured as linear variable, dummies of children's gender and race, and age (in the schooling models only). A descriptive analysis of the data with means, standard deviations, minimum and maximum values for each one is showed in Table 1.

Methods

In order to assess the impact of composition and number of siblings and household members on children's schooling in Brazil we first estimate models of educational attainment and age-grade gap for three age groups of children and adolescents: 7 to 10, 11 to 14 and 15 to 18. We will first model years of school attainment by estimating equation (1) using ordinary least square regressions:

$$(1) \qquad S_i = a + bF_i + cD_i + e_i$$

where S_i equals the years of schooling for age group *i*; F_i is a vector of a set of variables at the individual and family levels such as age, mother's schooling, race and sex of children; D_i is a vector of school characteristics such as percentage of schools with a library, percentage of schools with a computer lab and percentage of schools with a science lab, at the rural/urban and state levels; and e_i is a normally distributed error term.

We will then model the probability of children's school enrollment by estimating equation (2) using logistic regression:

$$(2) \qquad W_i = a + bD_i + cM_i$$

where W_i equals the probability of being at the appropriate age-grade level for age-group *i*; M_i is a vector of a set of variables at the individual and family levels such as age, mother's schooling, race and sex of children; D_i is a vector of school characteristics such as percentage of schools with a library, percentage of schools with a computer lab and percentage of schools with a science lab, at the rural/urban and state levels. In the final version of the paper the results will be shown on figures presenting predicted probabilities of school enrollment by cohort and region of residence, as well as tables with odds ratios of appropriate age-grade correspondence.

We first establish the relationship between individual and school-level characteristics and educational attainment and age-grade correspondence using one-level models. We will next develop Hierarchical Linear Models. These models are appropriate for this analysis because they

take into account variations in the second level of analysis, i.e., school information at the state rural and urban levels.

Hierarchical models are appropriate to analyze data that have different aggregation levels. According to Goldenstein (1998), almost all research data in social sciences present a hierarchical structure. In our study, students represent the first level of analysis and they are aggregated in schools, which correspond to the second level. When the hierarchical structure of the data is not considered, one may be overlooking the importance of group effects to which individuals belong. According to Raudenbush and Byrk (2002), hierarchical models assume that the dependent variable is related with a set of independent variables measured in different levels, in addition to the existence of residual variation at each level. According to them, better parameter estimates and the variance partition in components of each level are other advantages of taking into account the hierarchical structure in the analyses.

The analytical strategy is to employ nested HLM models beginning with a model of the effects of children and adolescents' individual-level characteristics on age-grade gap and schooling variables. The full model will add measures of quality of school for children and adolescents' region and rural/urban area.

We will develop separate models for schooling attainment in each age group as dependent variables. The first part of our first set of models is represented as follows:

$$Y_{ij} = \beta_{0j} + \beta_{1j}X_{ij} + e_{ij} \quad (3)$$

Where i identifies each student in each j rural/urban part of state; Yij is schooling; β_{0j} is the intercept; β_{1j} is the coefficient of the Xij group of independent variables at level 1 and e_{ij} is the residual error term. Xij will contain students' sex, race, working status, mothers' schooling, family structure.

The next part includes school quality variables at the urban/rural parts of the state. Equation 4 has the intercept β_{0j} calculated from equation 3. γ_{00} e γ_{01} are the intercept and slope of equation 4, and Z_j is a set of j level variables reflecting school and teacher characteristics aggregated by state and urban/rural; Uoj is the normally distributed error term . Equation 3 is similar to 1, except that now we are modeling the slope B1j from equation 1.

$$\beta_{0j} = \gamma_{00} + \gamma_{01}Z_j + u_{0j} \quad (4)$$

$$\beta_{1j} = \gamma_{10} + \gamma_{11}Z_j + u_{1j} \quad (5)$$

Equation 6 is finally the full model containing student and school quality measures at the state and urban/rural characteristics. This equation describes the general model that we will implement in this paper.

$$Y_{ij} = [\gamma_{00} + \gamma_{10}X_{ij} + \gamma_{01}Z_j + \gamma_{11}Z_jX_{ij}] + [u_{1j}X_{ij} + u_{0j} + e_{ij}] \quad (6)$$

Models of age-grade gap will also be developed. The results will indicate, for example, the extent to which school characteristics of rural or urban parts of a state explain better educational attainment and a higher probability of correspondence between the age and grade of 7 to 18 year-olds. With this exercise, we address the question of whether school quality factors at the state and rural/urban levels help to explain levels of children's educational attainment and school efficiency in Brazil.

Preliminary Results

During the last decades it was observed a significant improvement of the educational indicators among children and adolescents in Brazil (Lam and Marteleto 2002; Marteleto 2002). Besides such improvement in education, the distribution of education is still very unequal among states and regions and particularly between rural and urban areas. Table 2 illustrates some of the current Brazilian situation by providing mean years of schooling, proportion of children with age-grade gap, and enrollment rates by age group, region and rural/urban area. Our analysis will be at the state and rural/urban levels, but here we provide results at the regional and rural/state levels because our previous descriptive analysis of states demonstrates that states within regions demonstrate the same regional pattern (tables not shown).

Table 2 shows large gaps in schooling and age-grade gaps among regions. The more developed regions (South and Southeast) present the best indicators, while the less developed regions (North and Northeast) present the worst ones in all three age groups.

Children ages 7 to 10 have 1.45 mean years of schooling in the South region and 1.06 in the Northeast region. Children ages 11 to 14 have 4.84 mean years of schooling in the South region and 3.99 in the Northeast. Among adolescents ages 15 to 18, the gap is even larger: 7.76 years of schooling in the South against 5.86 in the North.

Large differences can also be seen between children within the same region when comparing rural and the urban areas. Children and adolescents who live in the urban areas have

more schooling than those in rural areas. For example, children ages 11 to 14 in urban areas have on average one more year of schooling than those from rural areas. The older the age, the larger the gap between rural and urban areas in all indicators. An explanation found in the literature is a trade-off between school and work, especially among low-income families (Levison 1991, 1998). In other words, older individuals have a stronger need to drop school to work and help their families and, because of that, their mean years of schooling is lower in this age group.

The problem of school drop out, grade repetition and low schooling contributes to an age-grade gap. This last index allows us to determine the proportion of children whose age is not compatible with their grade. Like schooling, the age-grade gap is higher in the North and Northeast regions, and lower in the South and Southeast regions. This indicator is also higher in the urban areas than in the rural ones. According to Table 2, the percentage of individuals with some age-grade gap among adolescents ages 15 to 18 in the South region is 61.88%, while in the North region it is 84.5%.

The percentage of children with age-grade gap is higher among older kids. For the whole country, the percentage of individuals with age-grade gap in the 7 to 10, 11 to 14 and 15 to 18 age groups are, respectively, 29.5%, 60.6% and 74.5%. In the age 15 to 18 group the age-grade gap is very high and the difference between rural and urban area is also large. In the Northeast region, for example, the percentage of children with age-grade gap is 84.5%, but considering only the rural area the number raises to 96.3%. In the urban area alone the number decreases to 80.5%.

Table 2 also shows that enrollment rates are high among children ages 7 to 10 and 11 to 14. For the ones aged 15 to 18, discrepancies on school enrollment in the rural and urban areas is high. Enrollment rates decrease with age, which is expected.

Overall, enrollment rates are high and have greatly increased in the last two decades (Marteleto 2001). An important point is that, although we show the success in the access of children to schools as observed in the high rates of school enrollment for all the ages groups, Brazil still shows the problems of low schooling and high age-grade gaps. This indicates that school enrollment is not necessarily translated into educational attainment in Brazil, reinforcing the role of grade retention and school drop out. The access to school, although essential, is not enough to increase the levels of the individuals' schooling, which are influenced by individual's own characteristics as well as by the quality of the educational system.

The means and percentages of individual and school characteristics are showed in Table 3. Table 4 shows that the North and Northeast present the worst quality indicators, when compared to the areas South and Southeast. While there are 47% of schools with 1st to 4th grades with at least one library in the South, in the North that value drops for 9,80%. The inequality is still larger when we compare rural and urban areas. In the rural North region, for example, just 2,07% of schools have a library, while in the urban North region we found 44,18% of the schools with libraries. The same inequality relationship can be observed in the others indicators: science and computer lab. However, on average, schools contain more libraries than sciences and computer laboratories.

Another important finding from Table 4 is the increase in the proportion of schools with library, science and computer labs in schools with secondary education. In the high schools of the South region, for example, 95,95% of them have a library, as opposed to 47,01% of the schools with 1st to 4th grades in the same region. The difference decreases when we analyze the percentage of schools with science and computer labs in the South region.

Table 5 shows preliminary results of OLS and Logistic models of schooling and age-grade gap, respectively. Results show that, overall, school factors at the regional levels are very relevant in determining both schooling and age-grade gap. Overall, children in regions with a higher proportion of schools with libraries, computer and science labs have better educational outcomes, net of individual- and family-level characteristics.

Our next step will be to develop appropriate HLM models and to add data for 1997.

Conclusions

Several studies on children's education in developing countries have recognized the importance of individual and family characteristics, such as gender, race, family income, parent's schooling, for better schooling results. Unavailability of data has prevented extensive research of educational attainment in developing countries using supply side factors. In this paper, we found that school factors at the regional and urban/rural levels are important determinants of schooling success. We will develop hierarchical linear models in order to appropriately account for variation in different levels of analyses. We will also add data from 1997, when there is availability of data at both levels.

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Table 1. Children and School Characteristics by Age Group: Brazil, 2001

	Means	Std. Dev.	Min.	Max.
7 to 10 years old				
Mother's schooling	5,64	4,18	0	15
Gender	0,49	0,50	0	1
Race	0,45	0,49	0	1
Age	8,48	1,12	7	10
Enrollment rate	0,97	0,16	0	1
Age-grade gap	0,70	0,45	0	1
Schooling	1,22	1,13	0	5
Library	47,44	25,34	0,71	88,32
Science lab	12,44	12,18	0	41,77
Computer lab	18,24	12,51	0	41,09
[N]	26927			
11 to 14 years old				
Mother's schooling	5,39	4,30	0	15
Gender	0,49	0,49	0	1
Race	0,45	0,49	0	1
Age	12,52	1,11	11	14
Enrollment rate	0,96	0,19	0	1
Age-grade gap	0,39	0,48	0	1
Schooling	4,24	1,76	0	9
Library	64,33	22,35	5,72	92,91
Science lab	23,18	19,29	0	57,17
Computer lab	28,61	19,01	0	67,25
[N]	27712			
15 to 18 years old				
Mother's schooling	5,33	4,41	0	15
Gender	0,45	0,49	0	1
Race	0,46	0,49	0	1
Age	16,42	1,11	15	18
Enrollment rate	0,81	0,38	0	1
Age-grade gap	0,25	0,43	0	1
Schooling	6,87	2,64	0	13
Library	78,25	16,33	12,9	100
Science lab	39,04	24,72	2,15	91,67
Computer lab	43,98	21,12	4,3	79,84
[N]	25524			

Source: Pnad, 2001.

Note: 1) Only kids who live with both their father and mother were considered.

Table 2. Means of schooling, percent of age-grade gap and enrollment of children and adolescents by age group, region and rural/urban, Brazil, 2001

	Schooling			Children with Age-Grade Gap (%)			Enrollment Rate (%)		
	rural	urban	total	rural	urban	total	rural	urban	total
Ages 7 to 10									
North	0.99	1.15	1.14	47.62	35.21	35.76	0.92	0.95	0.95
Northeast	0.80	1.15	1.06	51.03	33.66	38.39	0.95	0.97	0.96
Southeast	1.19	1.30	1.29	30.92	22.77	23.60	0.98	0.98	0.98
South	1.46	1.45	1.45	21.31	17.34	18.03	0.98	0.98	0.98
Center-West	1.20	1.37	1.35	32.47	23.52	24.70	0.96	0.98	0.98
Brazil	1.01	1.27	1.22	41.35	27.09	29.49	0.96	0.97	0.97
Ages 11 to 14									
North	3.10	4.00	3.96	88.72	69.85	70.62	0.97	0.96	0.96
Northeast	2.75	3.99	3.65	91.68	69.49	75.54	0.95	0.96	0.96
Southeast	4.25	4.76	4.71	68.18	46.58	48.91	0.92	0.97	0.97
South	4.43	4.84	4.77	52.23	41.05	42.92	0.94	0.97	0.96
Center-West	4.16	4.60	4.55	69.66	53.60	55.63	0.94	0.97	0.97
Brazil	3.39	4.41	4.24	79.87	56.70	60.59	0.94	0.97	0.96
Ages 15 to 18									
North	4.71	6.51	6.44	92.73	79.60	80.09	0.80	0.83	0.83
Northeast	4.24	6.41	5.86	96.30	80.54	84.50	0.75	0.85	0.82
Southeast	6.29	7.78	7.63	84.71	65.61	67.45	0.66	0.83	0.81
South	7.09	7.89	7.76	74.03	59.51	61.88	0.69	0.79	0.77
Center-West	6.16	7.34	7.19	87.62	71.11	73.10	0.75	0.83	0.82
Brazil	5.23	7.17	6.87	89.91	71.64	74.47	0.73	0.83	0.81

Source: Pnad, 2001.

Notes: 1) Only kids who live with both their father and mother were considered.

2) The rural data for North region includes only the state of Tocantins.

Table 3. Mother's Schooling, Gender and Race, by age group, region and rural/urban, Brazil, 2001

	Mother's schooling			Gender (ommited=male)			Race (ommited=non-white)		
	rural	urban	total	rural	urban	total	rural	urban	total
Ages 7 to 10									
North	3.61	5.76	5.67	54.42	50.46	50.63	22.45	25.37	25.24
Northeast	2.23	5.42	4.55	49.45	50.30	50.06	23.77	29.36	27.84
Southeast	3.56	6.78	6.45	48.47	49.52	49.41	52.04	58.26	57.60
South	4.26	6.63	6.22	45.84	50.28	49.50	83.65	83.64	83.64
Center-West	4.14	6.54	6.22	54.55	48.94	49.67	31.43	42.79	41.29
Ages 11 to 14									
North	2.49	5.72	5.58	38.35	50.32	49.83	18.05	25.56	25.25
Northeast	1.93	5.25	4.35	48.80	50.04	49.70	22.94	27.48	26.24
Southeast	3.29	6.50	6.16	47.97	49.28	49.14	47.01	60.29	58.86
South	3.94	6.43	6.02	50.59	47.84	48.30	82.79	82.47	82.52
Center-West	3.70	6.09	5.79	45.38	49.96	49.38	33.77	42.92	41.76
Ages 15 to 18									
North	2.74	5.50	5.40	32.73	44.03	43.61	12.73	27.32	26.77
Northeast	1.74	5.22	4.35	41.90	46.04	45.00	22.50	29.17	27.49
Southeast	2.80	6.26	5.93	46.56	48.24	48.08	48.62	60.16	59.05
South	3.82	6.60	6.14	44.03	46.01	45.69	80.65	84.14	83.57
Center-West	3.21	6.03	5.69	38.76	45.26	44.48	39.74	42.04	41.76

Source: Pnad, 2001.

Notes: 1) Only kids who live with both their father and mother were considered.

2) The rural data from the North Region includes only the state of Tocantins.

Table 4. School Quality Factors: Proportion of Schools with Library, Science and Computer Lab by Region and Rural/Urban, Brazil 2001

	% of schools with library			% of schools with science lab			% schools with computer lab		
	rural	urban	total	rural	urban	total	rural	urban	total
1st to 4th grade									
North	2.07	44.18	9.80	0.05	4.08	0.79	0.06	11.72	2.20
Northeast	1.36	36.53	10.73	0.03	5.07	1.37	0.07	12.01	3.27
Southeast	8.78	66.40	44.38	0.70	22.37	14.09	0.91	32.15	20.21
South	18.40	78.97	47.01	2.52	30.06	15.53	1.25	26.70	13.27
Center-West	5.45	50.45	32.91	0.28	9.22	5.74	0.87	22.34	13.97
Brazil	4.11	54.57	22.53	0.36	14.86	5.65	0.31	21.81	8.16
5th to 8th grade									
North	15.02	67.65	45.17	0.76	8.93	5.44	0.82	18.55	10.97
Northeast	11.19	57.43	42.30	0.47	11.27	7.74	1.11	21.50	14.83
Southeast	52.18	79.48	77.20	7.98	42.12	39.27	7.39	52.25	48.51
South	51.81	91.03	79.49	9.89	48.51	37.14	4.26	37.77	27.91
Center-West	20.78	60.85	53.72	2.88	16.64	14.19	3.40	25.84	21.85
Brazil	26.16	72.61	61.48	3.64	29.83	23.55	2.62	36.27	28.21
9th to 11th grade									
North	52.68	76.46	74.35	7.14	15.81	15.04	8.04	25.11	23.59
Northeast	34.38	70.88	68.91	7.81	21.86	21.10	10.94	33.85	32.62
Southeast	78.11	86.85	86.68	38.46	56.43	56.07	42.01	66.60	66.11
South	90.91	96.12	95.95	49.49	75.55	74.71	36.36	63.00	62.14
Center-West	49.32	69.71	68.82	13.70	26.53	25.97	16.44	30.23	29.62
Brazil	57.12	82.35	81.42	21.44	46.02	45.12	22.00	52.38	51.26

Source: School Census, 2001

Table 5 - Coefficients and Standard Deviations of OLS Regressions of Children's Education and Odds Ratio and Standard Deviations of Logistic Regressions of Children's Age-Grade Gap: Brazil, 2001

	OLS Regressions						Logistic Regressions					
	7 to 10 years old		11 to 14 years old		15 to 18 years old		7 to 10 years old		11 to 14 years old		15 to 18 years old	
	Coeff	SD	Coeff	SD	Coeff	SD	Odds Ratio	SD	Odds Ratio	SD	Odds Ratio	SD
Individual Level Characteristics												
Gender												
(ommited=male)	0.111***	0.009	0.363***	0.0160	0.730***	0.026	1.336***	0.041	1.591***	0.049	1.905***	0.068
Race												
(ommited=non-white)	0.114***	0.010	0.347***	0.017	0.542***	0.030	1.393***	0.046	1.785***	0.056	1.729***	0.066
Mother's Education	0.041***	0.001	0.111***	0.002	0.200***	0.003	1.131***	0.004	1.174***	0.004	1.189***	0.005
Age	0.734***	0.004	0.758***	0.007	0.622***	0.012	---	---	---	---	---	---
State and Rural/Urban Areas												
Schools with Library*												
(ommited=less than 25%)												
25% to 70%	0.104***	0.016	0.780***	0.033	0.298***	0,068	1.115**	0.053	2.881***	0.240	1,102	0.140
70% to 100%	0.223***	0.022	0.607***	0.050	0.597***	0.071	1.473***	0.108	2.361***	0.233	1.290**	0.165
Schools with Science Lab*												
(ommited=less than 10%)												
10% to 20%	-0.048**	0.024	0.079***	0.025	0.758***	0.039	1.473	0.093	1.036	0.043	1.720***	0.087
more than 20%	-0.004	0.028	0.589***	0.041	0.465***	0.053	1.477***	0.147	2.043***	0.127	1.567***	0.093
Schools with Computer Lab*												
(ommited=less than 10%)												
10% to 20%	0.033**	0.016	0.166***	0.028	0.889***	0.068	1.074	0.048	1.173***	0.051	2.007***	0.244
more than 20%	0.094***	0.027	0.245***	0.036	1.112***	0.076	1.046	0.093	1.399***	0.086	2.150***	0.275
Constant	-5.485***	0.037	-7.193***	0.094	-6.6278***	0.200	---	---	---	---	---	---
R Squared	0.5663	---	0.4403	---	0.377	---	---	---	---	---	---	---
Log Likelihood	---	---	---	---		---	-14.895,2	---	-15.526,8	---	-12.308,1	---
[N]	26,925		27,661		25,154		26,927		27,712		25,524	

Source: PNAD 2001 and School Census 2001

* Library, Science and Computer lab for schools that offer 1st to 4th grade for ages 7 to 10, 5th to 8th grades for ages 11 to 14, and 9th to 11th grades for ages 15 to 18 .

*** Significant at 1%, **Significant at 5%, *Significant at 10%