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Author(s): João Batista Gomes-Neto and Eric A. Hanushek

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Causes and Consequences of Grade Repetition: Evidence from Brazil*

João Batista Gomes-Neto
Universidade Federal do Ceará

Eric A. Hanushek
University of Rochester

Even though the problem of grade repetition is high on the policy agenda of virtually every developing country, extremely little is known about either the causes or the educational effects of repetition. The general concern about grade repetition derives from the budgetary and social implications of having large numbers of repeaters taking up scarce positions in schools. This concern notwithstanding, fundamental disagreements about the nature of the problem have clearly inhibited the development of sensible policies.

This research, relying on unique panel data for students in northeast Brazil, considers how the schooling system and individual students interact in determining enrollment patterns in primary schools. This investigation into underlying student and school behavior lays the groundwork for analysis of alternative policies.

Discussions of repetition are often subsumed in larger discussions of “wastage”—the combination of repetition and dropout rates.¹ This combination is unfortunate in many ways because the two phenomena are quite different in both their causes and their consequences. Nevertheless, they tend to be intertwined both in the data and estimation and in the policy debate. Indeed, the combination of high dropout and repetition rates has been identified as one of the main failures of the Brazilian education system, in part because the rates appear above those in other countries. A brief review of the available data and more general issues sets the stage for the analysis of grade repetition.

Reflecting the low level of information about the issues, disagreement arises immediately about the magnitude and form of the wastage problem. Commonly available and cited data reveal important discrepancies even among estimates of the level of aggregate wastage and its

components. The Brazilian Ministry of Education (MEC), for example, estimates the dropout rates for the first grade of primary education to be approximately 25% and the repetition rates to be approximately 30% in 1982, suggesting that dealing with dropouts (who leave the system entirely) is the first step toward fixing the Brazilian education system. On the other hand, P. R. Fletcher and S. C. Ribeiro, using a statistical model, estimate the dropout rate for the first grade at about 2% and for the repetition rate at about 55%, leading them to conclude that repetition is the main problem in the Brazilian education system.² Other researchers and even other government agencies (e.g., the Fundação Instituto Brasileiro de Geografia e Estatística, or IBGE) also question the MEC estimates and policy conclusions.³ Such differences show up further in more detailed investigations for specific regions of Brazil.⁴ The aggregate estimates of dropout rates differ not only in level but in pattern. The estimates of the Ministry of Education, for example, suggest that dropout rates decline with grade level, while the other estimates indicate that dropout rates increase with grade level.⁵ The discrepancies come from trying to infer dropout and repetition rates from aggregate age, grade, and enrollment data. By not following individual students, actual observations of student behavior are missing, and the rates are subject to error-prone estimation.

Disagreements also continue about the major causes of wastage. Some concentrate on problems outside the control of the school system, while others turn to factors inside schools. A variety of problems has been identified as the main out-of-school causes for school failures, and, importantly, each problem is directly related to the socioeconomic status of the student.⁶ High direct costs—for example, for buying uniforms, writing materials, textbooks, and the like—and sensitivity to the opportunity costs of attending school are more likely to strike the children from impoverished backgrounds. Other authors also identify malnutrition, which is clearly related to social and economic status, as one of the causes of the school failures, although the different studies are not consistent about this.⁷

The in-school explanations concentrate on specific resource constraints and the general low quality of some schools. Many researchers have pointed to problems of low-quality teachers as measured by low levels of education, low salary and motivation, and poor attitudes and expectations.⁸ Other analyses concentrate on specific school resources such as lack of writing materials and textbooks, insufficient material resources, and too little time in school.⁹ These arguments are frequently bolstered by data on aggregate expenditures. According to the World Bank, per pupil spending across states in Brazil ranges from US\$24 to US\$227.¹⁰

In this analysis we employ data from the rural northeast of Brazil to test the various hypotheses about the determinants and effects of

grade repetition.¹¹ The northeast region is extreme in its deprivation and, as such, is a reasonable starting point from a policy perspective. Further, we believe that many of the basic findings are transferable to other parts of Brazil as well as other developing countries.

The article begins with a short description of northeast Brazil, the laboratory for this analysis. Section II considers underlying factors affecting grade repetition including the availability of appropriate grade level instruction and the probability that an individual is retained in grade. Section III then turns to the learning that is accomplished through repetition. Section IV employs the basic learning and promotion data from the student panel to investigate the potential impact of mandatory promotion policies.

I. Brazil's Rural Northeast

Brazil is politically divided into five regions of which the northeast is the poorest.¹² The northeast region encompasses 18% of the Brazilian land area and had about 30% of the Brazilian population in 1990. But it generated only 13% of the national product. Mean earnings in 1988 in the rural northeast were 28% of the national average. While 20% of the population in Brazil had less than 1 year of schooling, this figure jumps to 39% in the northeast. Moreover, in the northeast 39.7% of the population over age 15 were illiterate, compared to 21% for all of Brazil.

Table 1 compares the Fletcher and Ribeiro estimates of repetition, dropout, and participation rates between all of Brazil and the northeast. It also displays the sizable discrepancies between urban and rural areas in the northeast. At each grade level, there is more repetition in the northeast than in the rest of Brazil, with the repetition rates in rural areas approaching double those for Brazil as a whole. Dropout rates rise across grades—something that is not particularly surprising given the low overall levels of completion and the increasing age of students. And, again, compared to other areas the rural northeast presents a bleak picture.

II. The Causes of Student Repetition

This section provides separate analyses of two components of grade repetition. First, because schools with appropriate grade levels are not necessarily available in rural areas, we study the underlying causes for a school that does not provide advanced grades. By comparing schools that do not provide instruction past the second grade with schools providing at least fourth grade, we obtain some insights into the determinants of schooling opportunities for students. We hypothesize that school and county characteristics will be the most important factors affecting the probability that a school provides advanced grades. Second, we analyze the underlying factors affecting individual

TABLE 1

REPETITION, DROPOUT, AND PARTICIPATION RATES IN BRAZIL AND NORTHEAST BRAZIL

	BRAZIL	NORTHEAST			Rural Low Income
		Total	Urban	Rural	
Repetition rate (% of enrollment):					
First grade	.54	.65	.58	.73	.74
Second grade	.33	.45	.42	.51	.53
Third grade	.26	.37	.33	.48	.50
Fourth grade	.20	.32	.30	.44	.49
Dropout rate (% of enrollment):					
First grade	.02	.04	.03	.05	.06
Second grade	.04	.07	.04	.12	.14
Third grade	.07	.09	.06	.16	.18
Fourth grade	.18	.16	.11	.29	.30
Participation rate (% of age cohort):					
First grade	.90	.79	.90	.68	.64
Second grade	.86	.71	.85	.55	.50
Third grade	.81	.63	.80	.42	.36
Fourth grade	.73	.53	.72	.29	.23

student grade repetition by comparing the students who were retained in the second grade for 2 years with other students. This allows investigation of the separate effects on student repetition patterns of student characteristics, family socioeconomic background, teacher and school characteristics, and community factors.

These analyses are feasible using a unique data source which permits tracking schools and students over time—a key element in any analysis of student flows. The EDURURAL data set, the basis for the micro analysis in this article, was constructed to permit evaluation of programs funded by a major educational loan from the World Bank to the northeast of Brazil.¹³ The sampling design included primary schools in areas that received loans and aid and in areas that did not. All of the schools were located in impoverished rural areas in the states of Ceará, Pernambuco, and Piauí.

A difficulty in the sampling was that no special effort was made to follow individual students. Indeed, the EDURURAL data set was not designed to answer the two main problems treated here, that is, what are the causes of repetition and what are the effects of repetition. Nevertheless, the sample design of the EDURURAL evaluation provides a unique opportunity to address these problems. The design called for repeated follow-up of sampled schools, by visiting them

initially in 1981 and then returning in 1983 and 1985. In each year, a random sample of students was drawn from the second and fourth grades in each school. It is possible to construct a panel, albeit limited, of students who were sampled in successive surveys. In 1983, of the 2,619 sampled students in the second grade 506 were sampled again in 1985. From this latter group, 127 students were still in second grade, forming the panel of grade repeaters that we use in this and the following sections.¹⁴

A. The Provision of Advanced Grades

A prerequisite for school attendance is the existence of a school with appropriate grades of instruction and located within a reasonable distance. School survival from year to year is not assured, as demonstrated in R. W. Harbison and E. A. Hanushek. Additionally, given that a school has survived, it is important to know whether it provides grades for further progress. A student cannot progress in a school that does not provide advanced grades. The absence of advanced grades has obvious implications for repetition patterns.

The sampling scheme of the EDURURAL project does not allow investigation of the general question of what determines whether or not a school exists for any individual student, but it does allow tracing the history and analyzing the existence of a fourth grade for those schools sampled. To do this we use a probit model to capture how school grade structure—as measured by whether or not the school provides the second grade as the most advanced grade—is affected by various external factors.

Table 2 summarizes the results of estimates based on the school sample from the EDURURAL data base. The explanatory variables used in the models can be divided into three categories: school characteristics, county economic conditions, and governmental support. For expositional purposes, the results of the estimation are translated into estimates of marginal probabilities evaluated at the means of the separate variables. (Variable definitions and full probit models are found in the Appendix.)

Two school factors are systematically related to the terminal grade in the school. Schools serving a larger number of students and schools with better facilities and equipment (“hardware”) are more likely to have a fourth grade (i.e., have a lower probability of ending at the second grade).¹⁵ Schools with satisfactory facilities and equipment are more likely to provide a complete grade structure. Further, schools located in the teacher’s house—a type of school with only minimal resources and support—are more likely to end at the second grade, but the estimated effect is not statistically significant.¹⁶

Local economic conditions have small and insignificant effects on the chances of having a fourth grade, although this limited estimated

TABLE 2
FACTORS INFLUENCING THE PROBABILITIES THAT A
SCHOOL ENDS WITH SECOND GRADE, 1983-85

Variables	1983-85
School characteristics:	
No. of students	-.0014
Hardware	-.3157
School in teacher's house	(.1198)
Economic conditions:	
Percentage selling crops	(.0038)
Participation in <i>Emergencia</i>	(.0024)
Organizational/governance factors:	
OME index	(.1210)
States:	
Piauí	(-.1857)
Cearà	(-.0353)
State and program:	
EDURURAL: Piauí	(.0691)
EDURURAL: Cearà	.2381
EDURURAL: Pernambuco	(-.0671)

SOURCE.—Appendix table A1.

NOTE.—Estimated marginal probabilities are calculated at means of variables, holding constant all other variables.

effect may in part reflect the rather crude measurement of local conditions. Local conditions are measured by the percentage of families that sell a portion of their crops and by the percentage of families participating in the *Emergencia* program—an employment program related to the severe droughts in the northeast that limited agricultural production.

The remaining factors relate to the organization and governance of the schools. Differences in support staff were not significantly related to the school's grade structure. Specifically, beyond paying for the building, teachers' salaries, and instructional equipment, governmental support for schooling typically involves both routine managerial control, inspection, pedagogical supervision, and technical assistance. The *Orgão Municipal de Educação* (OME) is the specialized county-level government agency established to institutionalize these functions of education administration. The specific measure of OMEs is an index including both quantity and quality of staff, but variations in this had little effect on the underlying probabilities of grades beyond the second grade. Of the measures of state and program status, the only significant difference was found in the EDURURAL program counties of Cearà, where schools were much more likely to end at the second grade. These estimates, which are compared to nonprogram areas in Pernambuco, indicate that schools are 24 percentage points more likely to

end at the second grade in Ceará areas covered by the EDURURAL program. However, the underlying reasons for these differences are not known.

B. Influences on Student Repetition

Whether or not individual student performance is related to repetition probabilities is a central issue in our analysis. This is extremely important for policy purposes because it offers insight into how to assess different proposals for dealing with retention rates and their mirror image, promotion rates. Specifically, if retention is only slightly related to actual student performance—that is, the student left behind are about as good academically as those who are promoted—then high repetition rates and high dropout rates may indeed represent wasted resources. Direct regulatory efforts to lower this wastage and increase promotions might well be called for. On the other hand, if repetition is highly related to student quality, decreasing the rates of repetition by continuing students with lower performance yields much lower benefits.

The analysis again employs probit techniques to compare the second-grade students who subsequently repeated the second grade twice with those students who followed some other path—that is, those promoted to the fourth grade in two years, those who dropped out of school, and those who are in the third grade. Of course, the comparison group of students is not homogeneous, and the policies for dropout students are surely different from policies for repeaters. Nevertheless, this initial analysis allows us to focus directly on the issue of repetition.

Another important policy variable is whether a school provides the second grade as the most advanced grade. If a school does not have a fourth grade in 1985, it is impossible to sample a student in this grade. More important, the student has no place to go in that school if promotion is warranted.

The repetition model, estimated by probit techniques, is summarized in tables 3 and 4. Again, for expositional purposes, the results of the estimation are translated into estimates of marginal probabilities evaluated at the means of the separate variables, and the estimated relationships are divided into individual factors (table 3) and institutional factors (table 4). The underlying probit models are found in Appendix table A2.

Because of the random sampling of students in the schools in each year, it is possible for an individual to be retained but not to be included in the sample. To deal directly with this, the probit model includes the number of students in the schools, since the probabilities of being missed by the sample are directly related to the number of students in the school. The school size measure (not shown) is signifi-

TABLE 3
EFFECT OF STUDENT AND FAMILY CHARACTERISTICS
ON THE REPETITION PROBABILITIES, 1983-85

Characteristics	1983-85
Female student	(- .0042)
Student's age	(- .0015)
Portuguese test score	-.0010
Mathematics test score	-.0005
Father's education	(.0002)
Mother's education	(- .0035)

SOURCE.—Appendix table A2.

NOTE.—Estimated marginal probabilities are calculated at means of variables, holding constant all other variables.

cantly negative in the probit model, reflecting this sampling within schools.

Student and family characteristics. Student background should directly affect repetition probabilities. Students in families with, for example, better-educated parents are expected to be less likely to repeat a school year than those whose parents have less education or are illiterate. There is a greater probability that students with higher previous achievement will be promoted than students with lower previous achievement.

The most interesting part of the model displayed in table 3 is the relationship between second-grade test scores and repetition probabilities.¹⁷ As shown in table 3, lower test scores consistently lead to greater repetition probabilities; this suggests that promotion has a basis in merit. Each 10 points on the Portuguese achievement test, which has a standard deviation of approximately 25 points, decreases the repetition probabilities by about 1%. The effect of the mathematics achievement test is half of this. Since the mean observed repetition rate in the sample was only 4% in 1983, these merit effects are significant. These results also confirm the findings in Harbison and Hanushek, where achievement on the second-grade test was found to be positively related with the student's on-time promotion probabilities.

Repetition probabilities are insignificantly different for girls and boys and the student's age also has no effect on repetition probabilities. Both are surprising because these two variables were found to affect the student's on-time promotion probability (see Harbison and Hanushek). Mother's and father's education are also not significantly related with the repetition probabilities, although they do influence student performance and thus are implicitly important.¹⁸

Grades provided by schools. As described previously, the availability of a school with advanced grades is not assured. Our specific

concern is how significant an incident of repetition is when related to lack of other schooling opportunities. Simply stated, a student who was in the second grade in 1983 cannot be promoted in schools where the second grade is the most advanced grade provided. Our probit model includes a dummy variable which equals 1 if the highest grade provided by the school is the second grade and equals 0 if the school provides grades for further progress. It is not surprising that students in a school where the second grade is its highest grade are constrained in their promotion probabilities. In fact, students placed in such schools have their repetition probabilities increased by 2.3 percentage points, which is huge compared with the mean observed repetition rate in the sample of 4%.¹⁹

Economic conditions and governmental support. As summarized in table 4, students in richer counties, that is, counties with a higher socioeconomic index, are more likely to repeat a year. We do not have a clear explanation for this except that the opportunity cost of attending school in better-off counties is higher and thus students are more likely to be absent. Unfortunately, we lack direct information on absenteeism. (The alternative view is that wealthier counties can better afford to make investments in schooling—a hypothesis predicting the sign opposite of that observed.)

The primary organizational measure reflects the quality and quantity of personnel in the OMEs. Students in counties with better OMEs are less likely to be retained in the second grade. There are also distinct differences in repetition probabilities across states, as shown in table 4. The repetition probabilities in Ceará are clearly the highest among the three states. A student in Ceará has a 4.7-percentage-point higher chance of repeating the second grade than a student in Pernambuco (the comparison state for this analysis). Piauí also has a 2.7-percentage-

TABLE 4
EFFECTS OF COUNTY ECONOMIC
CONDITIONS AND GOVERNMENTAL
SUPPORT ON THE REPETITION
PROBABILITIES, 1983–85

Characteristics	1983–85
Socioeconomic index	.0822
OME index	– .0418
States:	
Piauí	.0274
Ceará	.0474

SOURCE.—Appendix table A2.

NOTE.—Estimated marginal probabilities are calculated sample at means of variables.

point higher repetition rate than Pernambuco. Again, we cannot offer any specific explanations for these differences.

C. Summary of Repetition Factors

According to our statistical analyses, grade repetition has two major components. First, government provision of suitable schools with grades for student advancement is a prime factor. Other things being equal, the presence of grades beyond the second grade is an extremely strong determinant of student advancement. This suggests that government intervention to insure appropriate schools can have a powerful effect on repetition and wastage. Firmly established schools with adequate facilities, things that the government can influence directly, are required. Second, student achievement—as measured by mathematics and Portuguese achievement tests—is a key determinant of repetition. While some have suggested that repetition is based on factors other than student performance, such as local politics, the evidence points directly to the role of student performance.

III. The Achievement Effects of Repetition

Discussions of repetition tend to neglect one important aspect of the issue: students who repeat a grade are in fact attending school, albeit in the same grade as previously, and would be expected to learn something during the experience.²⁰ While this may be a very expensive way of organizing the learning process (the subject of attention below), it is nevertheless inappropriate to assume that repetition is pure waste.

A simple look at the overall achievement scores suggests that repetition does have noticeable learning effects. As shown in table 5, the mean achievement scores of the second-grade repeaters in 1983

TABLE 5
ACHIEVEMENT SCORES FOR ALL SECOND GRADERS AND FOR
GRADE REPEATERS: 1983 AND 1985

	ALL SECOND GRADERS		STUDENTS IN SECOND GRADE IN BOTH	
	1983	1985	1983	1985
Portuguese:				
Mean	58.7	59.6	40.2	61.1
Standard deviation	23.6	25.2	25.1	22.7
N (sample size)	3,944	4,321	127	127
Mathematics:				
Mean	51.2	49.2	35.7	52.4
Standard deviation	24.9	25.0	25.3	25.1
N (sample size)	3,944	4,321	127	127

were 40.2 and 35.7 in Portuguese and mathematics, respectively. These means were more than half of a standard deviation below the means of the entire second grade sample in 1983. In 1985, however, the means of achievement in Portuguese and mathematics of the repeaters (those in the second grade in both years) were slightly above the means of the entire second-grade sample.²¹

This analysis pursues two parallel lines of inquiry. First, we refine the estimates of the achievement gains from repetition presented above. Second, we explore whether individual student differences in achievement after repeating grades can be explained in terms of student or school factors. The overall framework for analysis follows a quite standard input-output specification for the educational process, but one modified to incorporate information about grade repetition.²²

The achievement of a given student at time t (A_t) is assumed to be related to current and past educational inputs from a variety of sources—the home, the school, and the community. To highlight some of the important features, we use a general conceptual model such as

$$A_t = f(F^{(t)}, S^{(t)}, O^{(t)}, \epsilon_t),$$

where $F^{(t)}$ = a vector of the student's family background and family educational inputs cumulative to time t ; $S^{(t)}$ = a vector of the student's teacher and school inputs cumulative to time t ; $O^{(t)}$ = a vector of other relevant inputs such as community factors, friends, and so forth cumulative to time t ; and ϵ_t = unmeasured factors that contribute to achievement at time t .

The approach is to measure the different possible inputs into education and to estimate their influence on student achievement. This conceptual model explicitly incorporates a stochastic, or random, error term— ϵ_t —to reflect the fact that we can never observe all of the factors affecting achievement. The estimation problem is simplified considerably if there is information on achievement at two different times, for example, at time t and at an earlier time t^* . It is possible then to include the prior achievement as one of the explanatory variables in the regression and to concentrate on the specific inputs over just the period t to t^* . This formulation, which is often called a “value-added” specification, gets around the lack of measurement of past inputs into the process and of other individual specific (but constant) factors such as ability.

A. Learning through Repetition—Cross-sectional Evidence

The simple differences in means for repeating students compared to all students (table 5) can potentially misstate the learning effects associated with grade repetition. When repeating students have special

characteristics or school circumstances that differentiate them from other students, the difference in means will misstate the separate effect of repetition.

We use a cross-sectional analysis of achievement differences to estimate the effect of repetition on student learning. Specifically, standard models that include student, family, and school factors are supplemented with information about repetition. A dummy variable which equals 1 if the student is repeating a school year and 0 otherwise is included to capture the independent learning effects of repetition. We estimate this model for second and fourth grades in 1983 and 1985, using the two achievement tests (Portuguese and mathematics) as dependent variables.

There are some obvious problems with this approach, and thus it should be viewed as a crude approximation of the effects of repetition. Three problems arise. First, repetition is not exogenous but is itself affected by performance. This implies that causation runs in both directions and that the estimates of the pure learning effect of repetition are biased. Second, the repetition measure does not indicate how many years had been repeated. Instead, it indicates only whether or not the student was in the same grade as the previous year. Therefore, it averages together varying amounts of repetition. Third, because of the structure of the EDURURAL data set, it is not possible to estimate the effects of repetition within a value-added context; such estimation can be done only in cross-sectional models. This heightens the chance that the estimates of the effects of repetition will be contaminated by other factors that are mismeasured.

Table 6 summarizes the effects of grade repetition on school achievement. It is not surprising that repetition is significant in most of the cross-section models employed here. Only for the second-grade specification in 1983 for Portuguese and mathematics achievement is repetition not significant at the 5% level. According to the estimates, by repeating the second grade students can raise their achievements by 2.6 points in Portuguese and 4.1 points in mathematics. In the fourth-grade estimates, the effect on mean achievement ranges from

TABLE 6
EFFECT OF REPEATING A SCHOOL YEAR ON ACHIEVEMENT
(*t*-Statistics in Parentheses)

GRADE	PORTUGUESE		MATHEMATICS	
	1983	1985	1983	1985
Second	.552 (.60)	2.632 (2.81)	1.574 (1.61)	4.149 (4.41)
Fourth	4.271 (3.42)	5.562 (4.85)	4.136 (2.60)	4.385 (2.92)

SOURCE.—Appendix table A4.

4.2 to 5.6 points in Portuguese and from 4.1 to 4.4 points in mathematics.

Note that these are the net relationships between achievement and repetition. If students who repeat begin at a lower level of achievement than those who do not repeat a grade, the period of repetition is more than sufficient to make up for the average starting decrement. After repeating, these students have higher test scores than those who did not repeat, holding constant family background and other factors.

This achievement, however, has costs. The student must spend at least one more year in the same grade at school. Beyond the increase in opportunity cost, the direct costs are not negligible, even in an area where the student cost is low. Assuming that all repetition lasts only 1 year, the average of direct costs in raising 1 point in Portuguese (mathematics) through repetition in the second grade is US\$11.40 (US\$7.23) and is US\$6.67 (US\$7.14) for repeating the fourth grade. While these costs may look small in absolute terms, they are large relative to the average student cost in the rural northeast, which is only US\$30.00.²³

B. Differential Learning While Repeating Grades

From the previous analysis we can conclude that students learn when repeating. We cannot conclude anything about which factors may be most important for learning during the period of repetition. Here we consider directly whether there are systematic learning differences among the grade repeaters by estimating value-added achievement models for repeaters. We use this specification in the special matched sampled 1983–85, where we could find 127 second-grade repeaters.²⁴

The results from these regressions (table 7) give us little guidance about what can improve the repeaters' achievement. Most of the variables used in the model are not statistically significant at the 5% level.

TABLE 7
EFFECT OF STUDENT AND FAMILY CHARACTERISTICS ON REPEATERS' ACHIEVEMENT,
1983–85 (*t*-Statistics in Parentheses)

Variables	Portuguese	Mathematics
Personal characteristics:		
Female student	4.660 (1.23)	-9.491 (-2.28)
Age	-1.690 (-2.28)	-1.619 (-1.98)
Parents' education:		
Mother's education	1.024 (1.05)	.044 (.04)
Father's education	-.521 (-.50)	1.218 (1.06)
Joint characteristics: pupil and school:		
Portuguese test score, 1983	.450 (4.18)	.218 (1.84)
Mathematics test score, 1983	-.002 (-.02)	.235 (2.29)

The main result is that students' previous achievement is consistently related with their achievement after repetition. This, of course, is not a surprise. In short, we do not have a good explanation for what makes a difference in the achievement of repeaters.

Beyond previous achievement, only students' age appears to be consistently affecting repeaters' achievements. The effect is negative; that is, older students do worse than younger ones. Mothers' education, which was consistently significant in the general achievement model (see Harbison and Hanushek), does not appear to have any influence at all for repeaters' performance. The same holds for fathers' education. These results are summarized in table 7.

The typical student in Ceará learned more over the period than the typical student in Piauí and Pernambuco, the other sampled states (see Harbison and Hanushek). This does not prove true for repeaters. Repeaters in all three states perform evenly. Despite huge repetition rates, none of the states appears to have any special program for them or, if they have, such programs do not appear clearly beneficial.

C. Summary of Learning Effects of Repetition

The central finding from the examination of achievement is that repetition does enhance a student's learning. On average, while students who repeat are below average in performance before repetition, they move to above average after repetition. Therefore, repeating a grade is not pure waste, as some would suggest. On the other hand, it is a very expensive form of schooling. Among repeating students, there is, however, no information on what specific factors determine differential achievement.

This is different from the evidence from the United States where achievement is found to decrease with repetition. The argument made is that repetition sufficiently lowers a student's self-esteem so as to negate any learning during the repeated year.

IV. Mandatory Promotion

Mandatory promotion is sometimes suggested as a means of reducing the resources wasted by high repetition. Indeed, if promotion and its mirror image, repetition, in the system are not highly related with the student's school performance, then a mandatory promotion policy could diminish the wastage with perhaps low cost to the educational system. This, however, is not the case that we found in our data; promotion²⁵ and repetition were strongly related with student achievement. If such a direct linkage is the case, we would expect mandatory promotion to lower the effective level of achievement associated with each grade, thus lowering overall school quality.

Nevertheless, the policy prescription cannot be decided on a priori

grounds. The high repetition and dropout rates observed in the Brazilian school system, especially at the primary school level, increase the cost of getting a student to any set completion level. This results simply because money is spent on people who never, or only very slowly, progress through the system. Therefore, it is worthwhile exploring this problem to try to infer what would happen if students who fail under the current system were promoted. At the very least, this allows for a more accurate description of the trade-offs.

A central question is how student achievement is affected by repetition and, inferentially, by mandatory promotion. Our previous analyses gave some indication of the average effects of grade repetition. Here we pursue another logical approach, investigating in more detail the entire distribution of promotees and repeaters.

A total of 3,944 students were sampled in the second grade in 1983. Of those, 506 were sampled again in 1985; 127 were still in second grade, while the other 379 had been promoted to the fourth grade. Table 5 provides the means and standard deviations of the Portuguese and mathematics achievement scores in the second grade for students repeating the second grade. (We were not able to obtain data for third graders.) In contrast, the students promoted on time to the fourth grade had average 1983 second-grade scores of 68.6 and 56.8 for Portuguese and mathematics, respectively. Thus, they were .2–.4 standard deviations above the mean instead of .6–.8 standard deviations below the mean as the repeaters were. By 1985, however, the means for the repeater group were slightly above the means of all students in second grade. While close, they are still behind the group that is promoted after the 2 years, and it took them 2 additional years to catch up with the grade average.

We can also go beyond the means and look at the distribution of performance. Figures 1 (Portuguese) and 2 (mathematics) give us an idea of the distribution of the achievement of the two groups. The distributions were calculated using z-scores (standard deviations from the mean), based on the means and standard deviations for all second-grade students in 1983. The distributions relate to actual second-grade scores for the matched sample of students repeating second grade. Since they took the test twice (in 1983 and in 1985), the gains in learning can be readily seen from the two solid lines. The dashed line indicates the score for the group of matched students who were promoted from the second grade in 1983 to the fourth grade in 1985.

These figures show clearly how grade repetition shifts the distribution of student performance. After repetition, the students are still somewhat behind the promoted students, although the distributions for mathematics become very similar. Also, and this is important, the figures show that the distributions of performance for repeaters and

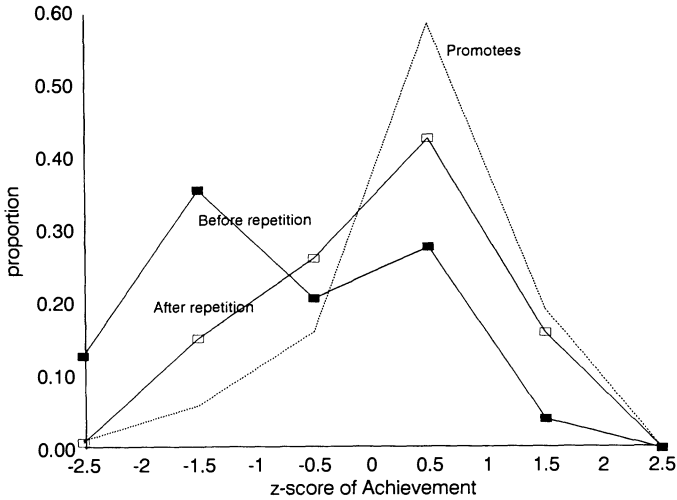


FIG. 1.—Actual second-grade Portuguese scores for promotees and repeaters before and after repeating second grade.

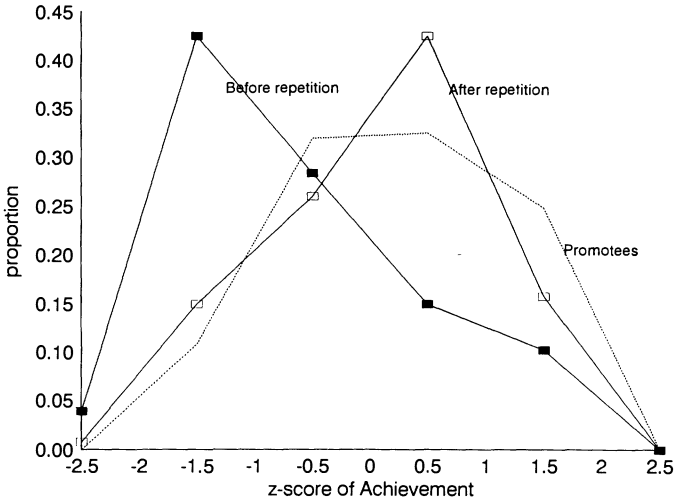


FIG. 2.—Actual second-grade mathematics scores for promotees and repeaters before and after repeating second grade.

those promoted overlap to a significant extent. This suggests that one crude analytical approach would be to project fourth-grade achievement on the basis of where each child falls in the distribution of those promoted. (For those promoted the distribution of fourth-grade scores in 1985 is known.) Such projections clearly make very strong assump-

tions. Significantly, they assume that the previous achievement is the only thing that influences promotion and subsequent fourth-grade student achievement. Such assumptions are almost certainly false, but this approach gives us some notion of an upper bound on achievement under a mandatory promotion policy.

We estimate the achievement or, at least, a range where achievement in the fourth grade will lie, if each student currently repeating the second grade were promoted. We begin by splitting the initial and final distribution into six subgroups: $Z\text{-score} \leq -2$; $-2 < Z\text{-score} \leq -1$; $-1 < Z\text{-score} \leq 0$; $0 < Z\text{-score} \leq 1$; $1 < Z\text{-score} \leq 2$; and $Z\text{-score} > 2$. We then calculate transition probabilities based on the experiences of the promoted students. Finally, we apply these transition probabilities to the distribution of second-grade scores for the repeaters. In this latter estimation we actually employ both the pre- and postrepeating score for the students. In other words, the use of the prerepeating scores relate to a pure “mandatory promotion” policy. The postrepeating scores relate to a modified plan of a fixed number of years in each grade. Table 8 shows the transition probability matrices used for Portuguese and mathematics performance. These come directly from the matched sample of on-time promoted students.

Figures 3 (Portuguese) and 4 (mathematics) display the results of this estimation. The solid lines indicate estimated fourth-grade scores with mandatory promotion from second to fourth grade and with promotion after the 2 years of repetition that are observed. These are compared to the actual fourth-grade performance of the students who were promoted (dashed line).

Two key findings emerge from these estimated distributions. First, the “current promotion” group—those promoted normally by the standards of the schools—do better than the repeaters. This is not particularly surprising. Second, the mandatory promotion distribution, derived from inferring the fourth-grade performance of those repeating based on their initial second-grade score distribution, looks reasonably close to that obtained for delayed promotion (i.e., after repeating for 2 years). This is especially true for Portuguese performance, reflecting in part that mathematics performance appears to improve more than Portuguese performance through repetition.

Since the delayed promotion is very costly—the full cost of 2 years of schooling—mandatory promotion may be an effective alternative to the current system. This is, it must be emphasized, just a second best policy. The first best policy is to improve the quality of primary schools so that student achievement is increased directly.

One group of repeating students—students who perform well on both the Portuguese and mathematics tests—is of special interest. In our

TABLE 8
 TRANSITION PROBABILITIES: PORTUGUESE AND MATHEMATICS ACHIEVEMENT, 1983-85

INITIAL ACHIEVEMENT, z-SCORE	FOLLOW-UP ACHIEVEMENT, z-SCORE					
	Less or equal to -2	Between -2 and -1	Between -1 and 0	Between 0 and 1	Between 1 and 2	Greater than 2
Portuguese:						
Less or equal to -2	...	...	...	...	...	...
Between -2 and -1	.25	.50	.25	.00	.00	.00
Between -1 and 0	.23	.32	.23	.18	.05	.00
Between 0 and 1	.05	.48	.23	.17	.07	.00
Between 1 and 2	.01	.12	.38	.35	.13	.01
Greater than 2	.00	.01	.18	.57	.21	.03
Mathematics:						
Less or equal to -2	...	...	...	...	...	...
Between -2 and -1	.06	.44	.42	.04	.04	.00
Between -1 and 0	.03	.32	.38	.16	.11	.00
Between 0 and 1	.00	.09	.39	.37	.15	.01
Between 1 and 2	.00	.05	.14	.45	.36	.00
Greater than 2						

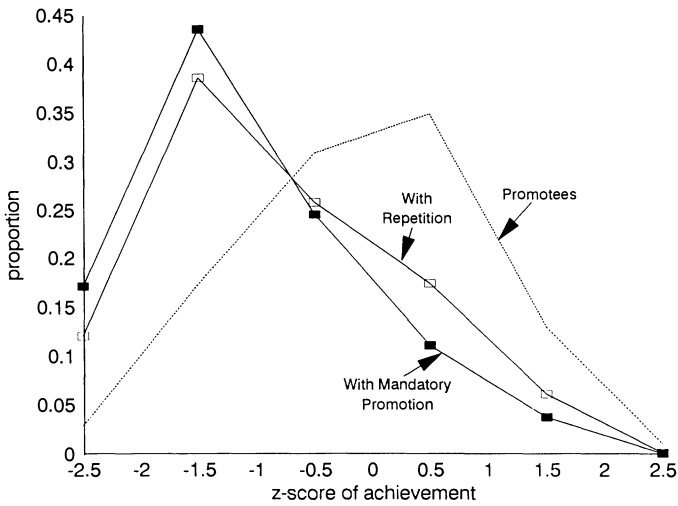


FIG. 3.—Estimated fourth-grade Portuguese scores after repetition and after mandatory promotion compared to actual scores of promotees.

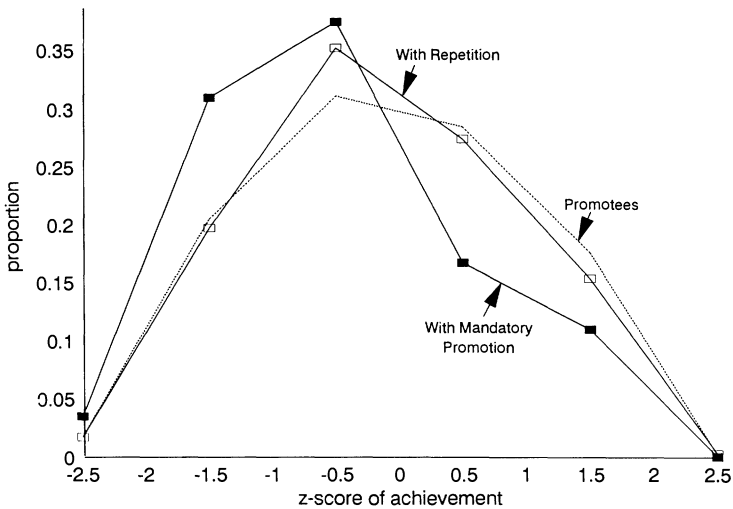


FIG. 4.—Estimated fourth-grade mathematics scores after repetition and after mandatory promotion compared to actual scores of promotees.

sample, 14% of the repeating students were above the mean performance on both tests when they initially took the tests. When we investigated their circumstances, however, we found that 13 of the 18 students were in schools that did not offer instruction past the second grade. This again underscores the room for alternative, quality-improving policies.²⁶

Of course, these findings must be highly qualified. It is quite likely that promotion involves other factors, observed by the teachers but not measured by the tests, that affect the learning of students. Therefore, inferring that the repeaters could acquire the third- and fourth-grade material at the same rate as those promoted on time is undoubtedly an overstatement.

V. Conclusions

It is impossible to ignore the problems of grade repetition in developing countries. The consistent pattern of students' being stuck in primary grades with the concomitant demands on scarce educational resources commands the attention of policymakers in most developing countries. Yet, despite its importance, extremely little is known about either the causes or the effects of repetition.

This article provides a systematic investigation of grade repetition in rural northeast Brazil. Employing a unique data set that allows observation over time of the same students, it is possible to estimate the determinants of repetition. Further, the educational effects of repetition are open to analysis.

The results are straightforward. Two factors are most important in determining repetition. First, student achievement levels are very important. Low performance—not other less educationally relevant factors—is a key element. Second, governmental policy as evidenced by supplying advanced grade levels in the schools is central. Simply put, if there is no place to go, students will stay where they are, repeating primary grades.

Repetition also has a direct impact on achievement. Repeating the second grade over a 2-year period moves students from between .5 and 1 standard deviation below the mean to a position close to the mean in achievement. But this is an expensive policy, and it is quite likely that there are alternative and less costly ways to improve achievement.

Mandatory promotion policies would produce lower achievement in later grades (because there is learning that goes on through repetition). On the other hand, while mandatory promotion appears undesirable to a policy of improving school quality, it does seem superior to the current unguided repetition policies.

These results, nonetheless, are based on rather small and less than perfect samples. The dearth of information about the entire process of promotion, repetition, and dropping-out behavior implies that informed decision making is extremely difficult.

Appendix

This Appendix provides variable definitions and complete statistical models that are summarized in the text.

Variable Definitions

Student Characteristics

Age	Student age (in years)
Female student	= 1 for female student
Student works	= 1 if student works (wording of question varied slightly by survey year)

Family Characteristics

Mother's education	Level of mother's formal education
Father's education	Level of father's formal education
Family size	Number of persons living in the household

Peer Influence

Percent families not farming	Proportion of families not farming (measured at school level)
Relatively large landholders	Proportion of families owning more than 35% of MODULO, a measure of minimum amount of land required to support a single family according to local land characteristics. MODULO is developed by IBGE.
% sold crops	Percentage of families who sell crops
Proportion female classmates	Proportion of female classmates
Female classmates if female student	= proportion of female classmates if the student is female; = 0 otherwise

Joint Characteristics: Pupil and School

Homework	1 if the student does homework always
School lunch every day	1 if the school receives lunch all year long
School lunch some days	1 if the school receives lunch only some months a year
Male teacher/male student	1 if both the teacher and the student are male
Female teacher/female student	1 if both the teacher and the student are female

School Characteristics

Graded class	1 if it is a graded classroom
Pupil/teacher ratio	Number of students divided by number of teachers in school
Hardware index	Index of furniture, facilities, water supply, and electricity; range = 0-1
Software index	Index of textbook and writing material availability; range = 0-1
Teacher's house	1 if the school is in the teacher's house
Number of students	Sum of the number of students in kindergarten through the fourth grade

Teacher Characteristics

Teacher activity index	Index of teacher classroom activities; range = 0-1
Teacher materials index	Index of classroom materials employed by teacher; range = 0-1
Teacher salary	Teacher salary as a percentage of the minimum wage

Teacher's mathematics test score	Teacher's score on fourth-grade mathematics test given to students
Teacher's Portuguese test score	Teacher's score on fourth-grade Portuguese test given to students
Years teacher's education	Level of teacher's formal education
Years teacher's experience	Years of experience as a teacher
LOGOS II—teacher training	1 if teacher took LOGOS (in-service training)
<i>Qualificação</i> training	1 if teacher took <i>Qualificação</i> training (in-service training)
<i>School Control</i>	
State operated	1 if a state school
Federally operated	1 if a federal school
Privately operated	1 if a private school
<i>County Characteristics</i>	
% <i>Emergencia</i>	Percentage of families whose head of the household works in the <i>Emergencia</i> program
OME	Index of the quantity and quality of personnel in <i>Orgão Municipal de Educação</i> ; range = 0–1
SES	Index of factors from principal components analysis of county economic conditions (see Armitage et al.)
<i>Program—State</i>	
EDURURAL—Pernambuco	1 if the county is in Pernambuco and in the Edurural Project
EDURURAL—Cearà	1 if the county is in Cearà and in the Edurural Project
EDURURAL—Piaui	1 if the county is in Piaui and in the Edurural Project
<i>State</i>	
Piaui	1 if state is Piaui
Cearà	1 if state is Cearà

TABLE A1

PROBIT ESTIMATES OF PROBABILITY THAT SECOND GRADE IS
HIGHEST GRADE IN SCHOOL

	Coefficient	<i>t</i> -Ratio
County characteristics:		
Percent selling crops	.0123	1.55
Participation in <i>Emergencia</i>	.0078	1.53
School characteristics		
Number of students	-.0044	-2.30
Hardware index	-1.0108	-2.80
Teacher's house	.3835	1.87
OME index	.3874	1.10
State:		
Piauí	-.5948	-1.36
Ceará	-.1130	-.29
Program and state:		
EDURURAL: Piauí	.2212	.63
EDURURAL: Ceará	.7624	2.40
EDURURAL: Pernambuco	-.2149	-.78
Constant	-.8279	-2.51
Sample size	489	
Mean probability	.241	
Log likelihood	-215.59	

TABLE A2

PROBIT ESTIMATES OF PROBABILITY OF GRADE REPETITION, 1983-85

	Coefficient	<i>t</i> -Ratio
Student characteristics:		
Female student	-.0491	-.53
Student's age	-.0174	-.93
Portuguese test, 1983	-.0119	-5.06
Mathematics test, 1983	-.0056	-2.32
Parent's education:		
Father's education (years)	-.0416	-1.43
Mother's education (years)	.0020	.09
School characteristics:		
Number of students	-.0043	-3.44
School not providing advanced grades	.2741	2.41
OME index	.4930	-2.24
Socioeconomic index	.9694	4.52
State:		
Piauí	.3230	2.44
Ceará	.5591	4.17
Constant	-.6857	-2.29
Sample size	3,240	
Mean probability	.039	
Log likelihood	-465.98	

TABLE A3
DETERMINANTS OF FOURTH-GRADE PORTUGUESE AND MATHEMATICS ACHIEVEMENT FOR GRADE REPEATERS: 1983/85
(*t*-Ratios in Parentheses)

VARIABLES	PORTUGUESE		MATHEMATICS	
	(1)	(2)	(1)	(2)
State:				
Ceará	1.156 (.14)	7.038 (.89)	9.448 (1.00)	13.265 (1.54)
Piauí	-11.886 (-1.36)	-11.745 (-1.40)	-11.474 (-1.19)	-11.248 (-1.23)
Program states:				
EDURURAL: Pernambuco	-2.791 (-.40)	-445 (-.07)	3.855 (.51)	5.457 (.73)
EDURURAL: Ceará	3.828 (.56)	4.997 (.75)	4.404 (.58)	5.364 (.74)
EDURURAL: Piauí	9.295 (1.13)	12.373 (1.68)	11.805 (1.30)	14.598 (1.82)
Personal characteristics:				
Female student	4.660 (1.23)	4.026 (1.11)	-9.491 (-2.28)	-10.009 (-2.54)
Student's age	-1.690 (-2.28)	-1.589 (-2.18)	-1.619 (-1.98)	-1.518 (-1.92)
Parents' education:				
Mother's education	1.024 (1.05)	.603 (.64)	.044 (.04)	-.167 (-.16)
Father's education	-.521 (-.50)	-.596 (-.58)	1.218 (1.06)	1.164 (1.05)
Joint characteristics: pupil and school:				

Portuguese test score, 1983	.450 (4.18)	.442 (4.15)	.218 (1.84)	.211 (1.83)
Mathematics test score, 1983	-.002 (-.02)	-.001 (-.01)	.235 (2.29)	.243 (2.44)
School characteristics:				
Graded class	-7.216 (-1.59)	-5.761 (-1.40)	-3.576 (-.71)	-2.271 (-.51)
Pupil-teacher ratio	-.047 (-.23)	-.119 (-.61)	-.210 (-.94)	-.258 (-1.22)
School hardware index	-3.901 (-.43)	-3.868 (-.43)	-.655 (-.07)	-1.133 (-.12)
School software index	12.297 (1.30)	15.485 (1.69)	25.004 (2.41)	28.124 (2.82)
Teacher characteristics:				
Years teacher's education	-.017 (-.23)		.024 (.03)	
Years teacher's experience	-.278 (-.86)		-.170 (-.48)	
LOGOS II—teacher training	-1.243 (-.24)		2.238 (.40)	
<i>Qualificação</i> —teacher training	4.867 (1.04)		4.979 (.97)	
Teacher's Portuguese test score	-.251 (-1.50)		-.216 (-1.17)	
Teacher's mathematics test score	.154 (1.26)		.128 (.95)	
Teacher's salary		.019 (.51)		.013 (.31)
Constant	65.581 (3.82)	53.842 (4.09)	47.648 (2.52)	39.297 (2.75)
Adjusted R^2	.422	.419	.419	.432
N (number of cases)	113	113	113	113
Statistic F	4.897	6.048	4.853	6.322

TABLE A4

DETERMINANTS OF PORTUGUESE AND MATHEMATICS ACHIEVEMENT FOR ALL SECOND GRADERS: 1983 AND 1985
(*t*-Ratios in Parentheses)

	PORTUGUESE		MATHEMATICS	
	1983	1985	1983	1985
Student is repeating a grade	.552 (.60)	2.632 (2.81)	1.574 (1.61)	4.149 (4.41)
Student characteristics:				
Female student	-.62 (-.02)	9.000 (2.85)	-9.816 (-3.28)	-4.489 (-1.41)
Student's age	.375 (2.37)	.600 (3.53)	.878 (5.17)	1.024 (5.95)
Student works	-1.155 (-1.04)	-.641 (-.38)	.311 (.26)	1.810 (1.08)
Family characteristics:				
Mother's education	.599 (3.35)	.680 (3.45)	.533 (2.78)	.496 (2.51)
Father's education	.681 (3.16)	.255 (1.14)	.931 (4.03)	.649 (2.87)
Family size	-.272 (-2.06)	-.396 (-2.88)	.030 (.21)	-.120 (-.87)
Peer influence:				
Percent families not farming	3.736 (1.67)	10.269 (3.92)	-.819 (-.34)	1.214 (.46)
Relatively large landholders	.061 (3.22)	.064 (3.00)	.042 (2.06)	.103 (4.82)
Percent female classmates	-4.466 (-1.46)	4.654 (1.41)	-.551 (-.17)	3.174 (.96)
Female classmates if female student	5.586 (1.44)	2.116 (.50)	1.028 (.25)	1.800 (.42)
Joint characteristics: pupil and school:				
Homework	3.427 (4.82)	3.430 (4.67)	2.590 (3.40)	2.071 (2.80)
School lunch some days	-4.594 (-3.05)	-11.267 (-3.05)	-4.795 (-2.97)	-10.005 (-2.69)
School lunch every day	-4.958 (-3.02)	-7.945 (-2.13)	-5.863 (-3.34)	-5.565 (-1.48)
Male teacher/male student	.503 (.26)	8.259 (3.44)	2.285 (1.08)	5.805 (2.40)
Female teacher/female student	1.553 (.87)	-4.122 (-2.02)	1.384 (.73)	-1.364 (-.67)
Percent seek 9 or more years of school	...	7.907 (5.04)	...	7.841 (4.97)

School characteristics:				
Graded class	-4.174 (-4.72)	.332 (.39)	-2.405 (-2.54)	-1.205 (-1.41)
Pupil-teacher ratio	-.064 (-2.19)	.074 (2.10)	-.038 (-1.22)	-.008 (-.23)
School hardware index	9.201 (5.45)	-2.243 (-1.22)	6.740 (3.72)	.825 (.45)
School software index	5.645 (3.12)	9.770 (4.65)	3.299 (1.70)	6.942 (3.28)
Teacher characteristics:				
Teacher's education	.793 (5.54)	.029 (.20)	1.228 (8.00)	.546 (3.68)
Teacher's experience	-.006 (-.10)	.000 (1.00)	.102 (.87)	.052 (.87)
LOGOS II—teacher training	3.365 (3.11)	2.021 (1.98)	2.225 (1.92)	2.111 (2.06)
<i>Qualificação</i> —teacher training	-.426 (-.41)	.607 (.60)	-3.912 (-3.49)	1.494 (1.47)
Teacher activity index	5.848 (2.94)	-4.475 (-2.06)	5.315 (2.50)	.866 (.40)
Teacher material index	1.888 (1.09)	.929 (.54)	2.461 (1.33)	-.229 (-.13)
Teacher's Portuguese test score	...	-.089 (-2.90)	...	-.159 (-5.17)
Teacher's mathematics test score	...	.138 (5.88)	...	.123 (5.18)
State:				
Piauí	11.230 (6.10)	.298 (.14)	-3.751 (-1.90)	-12.607 (-5.84)
Ceará	13.923 (8.87)	14.409 (7.78)	7.082 (4.21)	6.258 (3.36)
State and program:				
EDURURAL: Piauí	-1.973 (-1.36)	.700 (.42)	5.284 (3.39)	11.137 (6.71)
EDURURAL: Ceará	11.102 (7.74)	.316 (.23)	11.099 (7.22)	-.697 (-.51)
EDURURAL: Pernambuco	1.941 (1.34)	-3.866 (-2.20)	-.981 (-.63)	-9.139 (-5.16)
OME index	-1.323 (-.69)	-2.306 (-1.12)	-6.620 (-3.23)	-8.987 (-4.32)
School control:				
State operated	2.813 (2.20)	-.216 (-.15)	2.268 (1.65)	-1.919 (-1.35)
Federally operated	3.614 (.51)	13.360 (2.51)	-3.068 (-.40)	-3.657 (-.68)
Privately operated	8.434 (2.33)	5.904 (1.27)	5.792 (1.49)	3.459 (-.74)
Constant	26.486 (6.66)	30.970 (5.36)	23.188 (5.44)	31.008 (5.33)
Adjusted R^2	.143	.179	.126	.161
N (number of cases)	3,744	3,739	3,744	3,739
F statistics	18.887	22.470	16.358	19.807
Mean of dependent variable	58.766	59.630	51.095	49.025

TABLE A5

DETERMINANTS OF PORTUGUESE AND MATHEMATICS ACHIEVEMENT FOR ALL FOURTH GRADERS: 1983 AND 1985
(*t*-Ratios in Parentheses)

	PORTUGUESE		MATHEMATICS	
	1983	1985	1983	1985
Student is repeating a grade	4.271 (3.42)	5.562 (4.85)	4.136 (2.60)	4.385 (2.92)
Student characteristics:				
Female student	10.415 (3.24)	10.745 (3.57)	-2.284 (-.56)	-6.017 (-1.53)
Student's age	-.583 (-2.81)	-.962 (-5.02)	-.768 (-2.90)	-.798 (-3.17)
Student works	-5.990 (-3.70)	-6.665 (-2.90)	-3.235 (-1.57)	-5.682 (-1.89)
Family characteristics:				
Mother's education	.215 (1.00)	.332 (1.54)	-.044 (-.16)	.241 (.85)
Father's education	-.129 (-.50)	-.455 (-1.83)	.351 (1.08)	.049 (.15)
Family size	-.392 (-2.46)	-.014 (-.10)	-.062 (-.31)	.007 (.03)
Peer influence:				
Percent families not farming	1.463 (.62)	1.586 (.67)	-2.157 (-.72)	-1.810 (-.59)
Relatively large landholders	.042 (2.27)	-.044 (-2.36)	.037 (1.56)	-.045 (-1.85)
Percent female classmates	8.592 (2.45)	5.527 (1.81)	9.911 (2.22)	3.746 (.94)
Female classmates if female student	-7.688 (-1.77)	-5.236 (-1.32)	-12.672 (-2.29)	-.569 (-.11)
Percent seek 9 or more years of school	...	7.237 (5.04)	...	9.168 (4.87)
Joint characteristics: pupil and school:				
Homework	3.577 (3.70)	1.685 (1.91)	3.978 (3.23)	4.305 (3.72)
School lunch some days	-5.040 (-2.36)	9.666 (1.66)	-4.122 (-1.52)	11.416 (1.50)
School lunch every day	-5.907 (-2.59)	10.764 (1.84)	-3.042 (-1.05)	12.763 (1.67)
Male teacher/male student	1.364 (.58)	2.406 (1.04)	1.937 (.65)	5.022 (1.65)
Female teacher/female student	-1.170 (-.57)	-3.602 (-1.92)	-.499 (-.19)	-2.535 (-1.03)

School characteristics:				
Graded class	-.362 (-.30)	2.705 (2.62)	-2.417 (-1.57)	-.461 (-.34)
Pupil-teacher ratio	.086 (2.40)	.099 (2.67)	.150 (3.29)	.115 (2.35)
School hardware index	8.433 (3.97)	-2.046 (-.98)	7.639 (2.82)	3.015 (1.11)
School software index	1.518 (.72)	4.554 (2.13)	4.613 (1.71)	6.654 (2.37)
Teacher characteristics:				
Teacher's education	.543 (3.09)	-.313 (-1.83)	.816 (3.64)	-.514 (-2.29)
Teacher's experience	.002 (.03)	.041 (.61)	.043 (.56)	.240 (2.73)
LOGOS II—teacher training	.863 (.67)	-.124 (-.11)	2.192 (1.34)	-.549 (-.36)
<i>Qualificação</i> —teacher training	.542 (.40)	-.662 (-.56)	-.046 (-.03)	-3.129 (-2.02)
Teacher activity index	7.389 (2.70)	1.928 (.77)	2.848 (.82)	-5.809 (-1.78)
Teacher material index	-.128 (-.06)	1.073 (.53)	.428 (.15)	3.378 (1.27)
Teacher's Portuguese test score	....	.081 (2.06)	....	-.059 (-1.15)
Teacher's mathematics test score	....	.083 (1.95)	....	.203 (3.64)
State:				
Piauí	7.416 (3.58)	6.369 (2.79)	.107 (.04)	-.777 (-.26)
Ceará	11.825 (5.75)	13.051 (6.45)	9.383 (3.58)	7.832 (2.95)
State and program:				
EDURURAL: Piauí	-3.486 (-2.03)	1.208 (.67)	3.044 (1.39)	5.910 (2.49)
EDURURAL: Ceará	3.357 (1.63)	-.141 (-.09)	10.026 (3.81)	1.319 (.63)
EDURURAL: Pernambuco	-1.223 (-.71)	3.500 (1.92)	-1.859 (-.85)	-1.847 (-.77)
OME index	1.102 (.44)	3.217 (1.40)	.474 (.15)	-2.586 (-.86)
School control:				
State operated	-1.448 (-.94)	-2.726 (-1.74)	2.998 (1.53)	-4.587 (-2.24)
Federally operated	-.246 (-.03)	-2.929 (-.52)	-7.366 (-.73)	3.325 (.45)
Privately operated	14.587 (2.98)	-.386 (-.10)	3.943 (.63)	-6.621 (-1.26)
Constant	37.042 (6.98)	20.036 (2.44)	35.698 (5.28)	27.396 (2.55)
Adjusted R^2	.131	.161	.131	.120
N (number of cases)	1,448	1,594	1,448	1,594
F statistics	7.236	9.023	7.255	6.693
Mean of dependent variable	52.019	48.682	47.813	50.142

Notes

* This article benefited from helpful comments by Stanley Engerman and Richard Sabot.

1. The term "wastage" is commonly used but clearly quite misleading unless one believes that there is no return to schooling at the levels below which students drop out or repeat. At best it indicates forgone opportunities associated with not completing more schooling.

2. P. R. Fletcher and S. C. Ribeiro, "Modelling Education System Performance with Demographic Data: An Introduction to the PROFLUXO Model" (Brasília, March 8, 1989, mimeographed).

3. For comparisons of MEC, IBGE, and PROFLUXO estimates, see P. R. Fletcher and S. C. Ribeiro, "A Educação na estatística nacional" (Education in the national statistics), in *PNADs em Foco: Anos 80*, ed. D. O. Sawyer (1988), pp. 11–33. Other analyses can be found in P. R. Fletcher and C. M. Castro, "Os mitos, as estratégias e as prioridades para o ensino de 1º grau" (Primary school: Myths, strategies, and priorities), *Educação e Realidade* (Porto Alegre) 11 (January/June, 1986): 35–42; E. Schiefelbein, *Repetition: The Key Issue in Latin American Primary Education* (Washington, D.C.: World Bank, LAC Technical Department, Human Resources Division, 1989); and R. E. Verhine and A. M. P. Melo, "Causes of School Failure: The Case of the State of Bahia in Brazil," *Prospects* 18, no. 4 (1988): 557–68.

4. R. Kafuri et al., *Pesquisa sobre evasão, repetência e fatores condicionantes* (Research on dropout, repetition, and their conditioning factors) (Goiânia: Universidade Federal de Goiás, 1985).

5. These analyses tend to give simple comparisons of marginal probabilities and, as such, may confuse grade effects with other factors, including age of student.

6. Verhine and Melo, e.g., suggest that factors external to schools are the primary cause of first-grade dropout behavior. An alternative view concentrates on underlying political and social incentives, but these arguments go beyond our inquiry. Specifically, some authors posit that the educational system exists and was built in such a way as to maintain the status quo in Brazil's unequal order; see R. L. Garcia, "A qualidade comprometida e o comportamento da qualidade" (Jeopardized quality and its behavior), *ANDE* (São Paulo) 1, no. 3 (1982): 51–55; R. D. Oliveira, "Os movimentos sociais reinventam a educação" (Social movements and education reinvention), *Educação e Sociedade* (São Paulo) 8 (January 1981): 49–60; A. M. Popovic, "Enfrentando o fracasso escolar" (Facing the school failure), *ANDE* (São Paulo) 1, no. 2 (1981): 17–22.

7. L. A. Cunha, *Educação e desenvolvimento social no Brasil* (Education and social development in Brazil) (Rio de Janeiro: Francisco Alves, 1981); J. B. Gomes-Neto, E. A. Hanushek, R. H. Leite, and R. C. Frota-Bezerra, "Health and Schooling: Evidence and Policy Implications for Developing Countries," Working Paper no. 306 (Rochester Center for Economic Research, January 1992); J. Armitage, J. B. Gomes-Neto, R. W. Harbison, D. B. Holsinger, and R. H. Leite, *School Quality and Achievement in Rural Brazil*, World Bank Education and Training Series, No. EDT25 (Washington, D.C.: World Bank, 1986); and R. W. Harbison and E. A. Hanushek, *Educational Performance of the Poor: Lessons from Rural Northeast Brazil* (New York: Oxford University Press, 1992).

8. See, e.g., Armitage et al.; Verhine and Melo; Z. Brandão et al., *Evasão e repetência no Brasil: A escola em questão* (Dropout and repetition in Brazil: Questioning the school in Brazil) (Rio de Janeiro: Achiamé, 1983); N. F. McGinn, M. C. Soto, S. Lopez, A. Loera, T. Cassidy, E. Schiefelbein, and

F. Reimers, "Asistir y aprender o repetir y desertar, Síntesis del Informe," BRIDGES, 1991; G. N. Mello, *Magistério de 1º grau: Da competência técnica ao compromisso político* (Teaching primary education: From technical competency to political engagement) (São Paulo: Cortez, 1982).

9. See, e.g., Mello; Armitage et al.; McGinn et al.; and World Bank, *Brazil: Finance of Primary Education (A World Bank Country Study)* (Washington, D.C.: World Bank, 1986).

10. See World Bank, *Brazil: Finance of Primary Education*; Armitage et al.; and A. C. Xavier and A. E. Marques, "Custo direto de funcionamento das escolas públicas de primeiro grau na região Centro-Oeste" (Direct cost of primary public school in the center-west region) (Brasília, 1984, mimeographed). The concerns about the availability of resources are heightened by the arguments of S. P. Heyneman and W. A. Loxley, "The Effect of Primary School Quality on Academic Achievement across Twenty-nine High- and Low-Income Countries," *American Journal of Sociology* 88, no. 6 (1983): 1162–94. After comparing many educational systems, they conclude that the poorer the country, the greater is the effect of the school in the student performance.

11. Dropout behavior is analyzed separately in Harbison and Hanushek.

12. Statistical information in this section is drawn variously from (i) *Anuário Estatístico do Brasil, 1990*, IBGE; (ii) *Educação—indicadores sociais*, vol. 1, IBGE; (iii) *Pesquisa Nacional por Amostra de Domicílios, 1982*, IBGE; (iv) PROFLUXO model, developed by Fletcher and Ribeiro, "Modelling Education System Performance with Demographic Data"; and (v) World Bank publications, including specifically *Brazil: Economic Survey Report: Northeast Region: Development Issues and Prospects*, Report No. 6894-BR (July 20, 1987).

13. The EDURURAL project was a US\$92 million undertaking of the Brazilian government and was launched in 1980. It received US\$32 million in loans from the World Bank and involved a comprehensive set of resources supplied to specific schools. The analysis here, however, is not concerned with the specifics of the evaluation but instead merely relies on the data that were generated to evaluate that project. More complete information about the EDURURAL data set can be found in Armitage et al. and Harbison and Hanushek.

14. The sample involved surveying second and fourth graders at 2-year intervals. Only the 1983–85 matched sample, however, provides sufficient numbers of students repeating the second grade. The remaining 379 matched students were promoted to the fourth grade and provide the basis for estimating achievement value-added models; see Harbison and Hanushek.

15. The hardware index measures physical facilities in schools such as number of classrooms, existence of multipurpose room, kitchen, secretary/principal office, and desks for students.

16. This is the marginal effect of the school being located in the teacher's house after considering the quality of facilities (typically these are below average). Note, however, that there may be some definitional problems of what constitutes a fourth grade since multigrade instruction is also common.

17. The Portuguese and mathematics tests employed here were developed specifically for the EDURURAL project by a team of psychometricians from the Fundação Carlos Chagas. The tests, developed in 1981 and improved in later years, were criterion referenced to minimally acceptable levels of performance in second- and fourth-grade mathematics and Portuguese. The tests' reliability, ascertained by constructing Cronbach's alpha coefficients, shows reliability coefficients of 0.9 or better with the exception of the fourth-grade

Portuguese scores. Moreover, test reliability tends to be stable over time and across states. For more information on the tests, see Harbison and Hanushek.

18. Verhine and Melo (n. 3 above) emphasize the importance of socioeconomic factors, something that does not seem too consistent with these estimates. The difference from our results may be partially explained by the restricted sample used here; all students are from poor rural families.

19. McGinn et al. pinpoint another characteristic school organization—the use of multigrade instruction—as an important element of repetition. Direct analysis of this in our sample, however, did not support any different repetition patterns with the use of multigraded classes.

20. Learning during repetition has been the subject of investigation in the United States. See, e.g., L. A. Shepard and M. L. Smith, “Synthesis of Research on Grade Retention,” *Educational Leadership* (May 1990): 84–88; L. A. Shepard and M. L. Smith, eds., *Flunking Grades: Research and Policies on Retention* (Philadelphia: Falmer Press, 1989). These analyses conclude that achievement after repetition is actually lowered. However, this somewhat surprising result may reflect imperfect measurement of students’ prior achievement.

21. Note that all students identified as repeaters were sampled in the second grade both in 1983 and again in 1985.

22. Harbison and Hanushek provide more complete information about the specific statistical models. The general framework is described in detail in E. A. Hanushek, “The Economics of Schooling: Production and Efficiency in Public Schools,” *Journal of Economic Literature* 24 (September 1986): 1141–77.

23. See Harbison and Hanushek; and Xavier and Marques.

24. As described in Harbison and Hanushek, revisiting sampled schools turned up a number of students who were sampled in two successive surveys. The models here employ the restricted sample of students in the second grade both years in order to understand the effects of family, community, and school factors on achievement growth. The sample, unfortunately, is quite small, making the detection of differential effects difficult.

25. See Harbison and Hanushek.

26. The previous analysis of predicted fourth-grade performance (figs. 3 and 4) is not substantially affected by limitations on grades offered. A total of 42 students in the sample of repeating students was found in schools ending at the second grade, and these students were distributed across the entire performance distribution. Therefore, when we duplicated the mandatory promotion analysis with the grade-limited students eliminated, we obtained the same qualitative results.