Inter-American Development Bank
Banco Interamericano de Desarrollo (BID)
Latin American Research Network

The Quality of Education in Latin America and The Caribbean

The Quality of Education in Paraguay

by

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February 2009

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Abstract

This study of Paraguay's educational system represents an effort to evaluate the quality of education in Paraguay to guide policy makers toward the sorts of educational investments that show the most promise in improving the quality of education in Paraguay. It does this by assessing the link between school level educational resources and policies and students' performance.

The study finds little correlation between measures of school resources and students' performance. Moreover, it finds that average student performance does not vary significantly between schools, particularly after controlling for the characteristics of the students. We thus conclude that the major factors associated with educational quality in Paraguay are those beyond the classroom and school. While over the last decade or two Paraguay has made considerable progress in improving access to school and school retention, the results of this study underscore the point that barriers to learning are not so easily overcome by time spent in school.

Based on our analyses, we arrive at five recommendations. The first addresses the perpetual problem of using cross sectional data (such as used in this study) to reach causal statements. We recommend that Paraguay's Ministry of Education fund a careful longitudinal study of student performance. Second, we believe MEC should reevaluate the use of the SNEPE as an evaluative tool. Third, MEC should examine the content and progression of Paraguay's curriculum for its appropriateness, consistency, and logical progression. A fourth recommendation is that MEC prioritize teacher training in methods and strategies that account for a wide range of abilities in the classrooms. Finally, we recommend that MEC reevaluate the training and hiring practices of Paraguay's teachers.

We would like to thank the Ministry of Education and Culture (MEC) of Paraguay for the timely provision of the information and the broad support given to this investigation.

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1. Introduction

In recent years, Paraguay has undertaken numerous steps to improve its educational system. Important among these has been improving access for formerly excluded groups. While the country has made impressive progress in access and retention, problems with the quality of education persist. Both national and international studies indicate that too many students in Paraguay are far below minimum levels of competency in basic areas such as language and mathematics.

As is true in many Latin American countries, little quantitative research has been undertaken to examine the factors associated with student performance in Paraguay. Some claim that Paraguay's reforms in pedagogy and school management have not been adequate: that teachers continue to use traditional pedagogic models and school management remains authoritarian and overly bureaucratic, with inadequate focus on student performance (Corvalán. 2008). Others claim that changes in Paraguay's social, economic and cultural life are presenting new challenges to schools: poverty, migration, child labor, family disintegration, the overwhelming presence of new models of social relations promoted by the media, and changes in labor market, among others, have made it harder to educate children (Consejo Nacional de Educación y Cultura, CONEC. 2007). Finally, some claim that the country faces particularly challenging social and cultural complexities, indicated for instance by having Guaraní as the predominant language among many Paraguayans.

To date, none of these claims have been investigated with any rigor, despite the fact that policy to address the low achievement level of Paraguay's youth depends on identifying why performance is so inadequate. This study of Paraguay's educational system represents an effort to evaluate the factors best explaining student performance in Paraguay as a way to guide policy makers toward the sorts of educational investments that will show the most promise in improving educational quality in Paraguay. While gains still need to be made in educational access and retention, we believe the most pressing challenge facing Paraguay's educational system is improving its quality.

By seeking to assess the link between school level educational resources and policies and student performance, and assess the adequacy of the current educational system in providing a quality and equitable education for Paraguayans, we address the following issues facing Paraguay:

- What is the relationship between individual and school-level factors in Paraguay, and students' cognitive ability?
- How do learning outcomes and the factors associated with learning outcomes in Paraguay compare with other Latin American and Caribbean countries?.

To address these questions, we use SERCE[1] test scores (and to a lesser extent national SNEPE test scores from within Paraguay) from tests administered across Latin America and the Caribbean in 2006. In particular, we examine the test scores of over 1,500 6th graders in Paraguay. We arrive at the following findings:

- Most of the variation in test scores among Paraguay's 6th graders occurs at the individual rather than the school level. One conclusion from this variation among students, then, might be that explaining low performance must begin with examining the conditions in the home, family, and other aspects of the environment in which children are raised. While we conclude that individuals and families matter for educational outcomes, we cannot conclude why and exactly how. To this end we conclude that Paraguay would benefit from a good longitudinal study of student performance over time.
- For the most part, our models are unable to explain anything but a small part of the differences in the test performance among Paraguay's students. We believe that overall, this points to the very low ability-level of Paraguay's students, such that tests intended for 6th graders are not well designed for Paraguay's 6th graders. This conclusion is reinforced by the finding that among **all** students who took the 6th grade SERCE tests, school resources and background characteristics can explain a significant share of test score variation (UNESCO, 2008). This may indicate a problem in the progression of curriculum in Paraguay's schools. If the SNEPE and SERCE are designed to test the material taught up to the third and sixth grade, then either the curriculum in practice is not aligned with the test, or that the expectations in the curriculum are not aligned with the ability level of the students. Either reason indicates that one explanation for Paraguay's low student performance may be Paraguay's curriculum.
- The data also suggest why a logical and systematic progression of material in Paraguay's schools may be hard to implement: student performance within

[1] SERCE is the Second Comparative and Explanatory Regional Study (Segundo Estudio Regional Comparativo y Explicativo. Los Aprendizajes de los Estudiantes de America Latina y el Caribe, in Spanish), elaborated by UNESCO and LLECE (Laboratorio Latinoamericano de Evaluación de la Calidad de la Educación). June 2008.

classrooms varies considerably. This indicates that teachers may be faced with a particularly challenging task of teaching children of very different ages and very different ability levels.

- We reach several findings regarding teachers. First, we find evidence that student performance is higher with more educated teachers. The clear implication is that Paraguay needs to work to attain more educated teachers. And while experience is rewarded in terms of salary, more experienced teachers do not appear to be better teachers. The evidence also calls into question the usefulness of teacher training. Findings based on SNEPE[2] test scores indicated that teacher absenteeism was significantly related to student performance, a finding the analysis using SERCE scores also suggests. Overall we conclude that efforts should be made to improve teacher attendance, especially given the high rate at which this was reported to be a problem (**Table 9**).
- Finally, there is some evidence that test scores are higher in schools with nutrition programs, and where principals (directors) have greater autonomy.

Based on these findings, we make the following five recommendations:

1. Paraguay's Ministry of Education and Culture (MEC) should fund a careful longitudinal study of student performance, which collects detailed information on parents, students and school characteristics. It might also consider randomized studies to measure the impact of nutrition programs and principal autonomy.
2. MEC should reevaluate the use of the SNEPE as an evaluative tool.
3. MEC should examine the content and progression of curriculum for its appropriateness, consistency, and logical progression.
4. MEC should investigate the effect on educational outcomes of having so many underperforming students in classrooms. At the least, MEC should prioritize teacher training in methods and strategies that account for a wide range of abilities in the classrooms; and strategies to improve the performance of the lowest-performing students in the earliest grades.
5. Finally, MEC should reevaluate the training and hiring practices of Paraguay's teachers.

[2] SNEPE is the National System for the Evaluation of the Educative Process (Sistema Nacional de Evaluacion del Proceso Educativo, in Spanish). Ministry of Education and Culture of Paraguay.

Below our report is presented in 5 additional sections. The first presents a brief overview of research findings related to the quality of education. To provide a context in which to evaluate the performance of students in Paraguay, we present an overview of Paraguay's educational system, followed by a third section comparing the educational system and outcomes in Paraguay with other Latin American countries. A 4th section presents the results of our quantitative analysis of student performance. A final section concludes.

2. Literature Review

A vast body of literature exists examining the relationship between educational inputs and the quality of education, as typically measured by test scores. While most of this research focuses on developing countries, the number of studies conducted in developing countries has been growing. In this section, we present a brief review of a subset of this literature, highlighting in particular studies performed in Latin America. By and large, the research has found wide variation in educational quality and the factors that influence it, making generalizations hard to reach.

Perhaps the most consistent finding, within and between countries in this research area is the importance of student background characteristics on student performance (Hanushek and Luque. 2003); (Wöβmann. 2003). For example, it is a common finding that test score variation within schools is much larger than test score variation across schools (Lee and Bryk. 1989); (Choi and Kim. 2006). Exactly why learning among individual students is so variable is much harder to establish. But clearly the role of family and other background characteristics of students are important factors in explaining differences in students' academic performance (Ginther and Pollak. 2004); (Guo and Harris. 2000); (Lee and Burkan. 2002). For example Wöβmann (2005) found a relationship between test scores and family background in Argentina and Colombia, while school characteristics did not appear to be important in explaining test scores.

Yet much research does document the importance of the educational system on students´ performance. In developed countries, much evidence points to the importance of teacher characteristics (Ehrenberg and Brewer. 1994); (Sanders and Rivers. 1996). A study in Brazil also concluded that teacher qualifications were important factors in students' test scores (Harbison and Hanushek, cited in Glewwe (2002)). Molinas (2002) conducted a study of educational performance based on results from Paraguay´s National System for the

Evaluation of the Educative Process (SNEPE) test. Based on third grade students´ test scores in language and mathematics, Molinas found that student test scores were lower when teachers had more advanced credentials, performance was higher when teachers had more experience, and that pedagogic materials improved student performance. One analysis of individual LLECE results (UNESCO, 2001) found that test scores were higher where students had attended preschool, where school size was smaller, where teachers were more dedicated, and where teachers had higher expectations of their students. Indeed, a recent World Bank report argues that improving teacher quality is one of the more promising areas of educational reform in Latin America (Vegas and Umansky. 2005).

Differences in the quality of education received by students have also been traced to differences in students' opportunities to learn a subject matter, due to school-level factors. In the U.S., for example, math curriculum can be extremely variable, and researchers have linked this variability with students' math scores (Cogan, Schmidt and Wiley. 2001); (Schmidt. 2003). In India, a randomized study found that frequent teacher absences played an important role in students' cognitive gains over the year (Duflo and Hanna. 2006). In another study in Bolivia, Urquiola (2006) found that students learned more in smaller classrooms.

Yet research findings suggest it is hard to generalize about which classroom factors matters most for student performance. For example, in a study on the impact of increased textbook distribution on student test scores in Kenya, Glewwe, Kramer and Moulin (2007) found that textbooks helped improve the scores of the best students, but not of the average student. They concluded that government-designed educational materials were developed for the stronger students, and thus were of limited use to most of Kenya's students. They also further suggest that the mismatch between resources and curriculum and student ability help explain the low quality of Kenya's educational system. Glewwe and Jacoby (1994) examined middle school students' performance on mathematics and reading tests in Ghana. Controlling for students' background characteristics, they found that one of the most important factors associated with test scores was the condition of the physical environment of the school --more so than the quality of instructional material and the teacher. They also found that schools in better condition helped with student retention.

Another school-level factor that has been shown to be an important factor in explaining students' performance is the characteristic of the students' peers. In the U.S., Hanushek, Kain, and Rivkin (2004) found that black students' performance in math is negatively associated with the percentage of black students in the school. Fryer and Torelli (2006) find evidence that black and Hispanic students with higher GPAs have fewer friends

than white students with the same GPA. Both Hoxby (2000) and Betts, Zau and Rice (2003) find that student achievement increases when peers have higher test scores. In Chile, McEwan (2003) found that peer effects, measured as the average educational attainment of mothers in each of 163,000 eighth grade student's classroom, proved to be an important predictor of these students' scores in math and Spanish. An analysis of SERCE results (UNESCO, 2008) found that the test score of students in schools with greater socioeconomic or cultural segregation was associated with lower test scores.

The relative effectiveness of private versus public schools has been a source of much research and debate, but problems of selection bias and peer effects make this a difficult area of inquiry. In one careful study that accounted for selection bias and peer effects, McEwan (2001) investigated the effect of Chile's voucher system, and found no significant difference in student performance between the Chile's private and public sector schools. Mizala and Romaguera (2000) also analyzed Chile´s voucher system, and similarly found that students' performance in voucher schools, all else the same, was not higher than in the traditional public school system.

Finally, considerable evidence indicates that the institutional context in which education occurs can play an important role in student outcomes. Internationally comparable databases on student outcomes (TIMSS, PISA and PIRLS) have permitted comparative analyses of student outcomes across nations, which allow for investigating the importance of institutional differences between countries. Some studies have shown that the presence of central examinations and other organizational features of countries help explain differences among countries in student performance (Hanushek and Luque, 2003; Jürges and Schneider, 2004; Wöβmann, 2005a).

3. Paraguay's Education System

Since 1989, Paraguay has initiated numerous reforms of its educational system. The most important of these have been extending mandatory education from 6th to 9th grade, introducing bilingual education, developing a universal pre-school program, using incentives to retain students, and making textbooks and other instructional material more widely developed. Paraguay also now uses a national test (SNEPE) to assess student performance. However, challenges remain. Only 3 of 10 children who enter first grade complete a secondary education, the quality of teachers is low, and student performance remains very low.

Enrollment in Private versus Public Education

Paraguay's educational system can be divided into three levels. The preschool level includes children from 0 to 5 years old. Basic education (Enseñanza Escolar Básica – EEB, in Spanish), for children 6 to 14 years old, is divided into three cycles: first cycle (1st to 3rd grade), second cycle (4th to 6th grade) and third cycle (7th to 9th grade). Finally, the third level is referred to as Educacion Media (EM); and typically includes the 15 to 17 year old student population.

There are three different types of schools in Paraguay:

1. Public schools which receive funding from the national government.
2. Private institutions which receive some public funds (provided mainly for teacher salaries in religious schools)
3. Private institutions that receive no subsidies.

Table 1 below shows the distribution of students by school level and by school type (public, private, and the subsidized private sector). As shown, by far the majority of students are enrolled in the public sector, with enrollments in the subsidized private sector averaging around 10 percent, with about 10 percent more enrolled in other types of private schools.

Table 1

Distribution of enrollment by sector and education Level, 2006

Source: Authors' calculations based on data from MEC. 2006.

Coverage

Since the implementation of reforms to improve access and retention, school enrollments in Paraguay have significantly increased, as shown in **Table 2** and **Graph 1**. Primarily this increase can be attributed to the government's building of new schools (**Table 3**), especially in rural areas. As shown in **Table 2**, enrollments among both preschoolers and older students

in Paraguay's rural areas have increased dramatically over the last 10-15 years, and this increase corresponds with changes in the number of schools over this period (**Table 3**).

Table 2

School enrollment by educational level and area of residence, 1994 and 2006

Source: Authors' calculation based on information from MEC. 2006.

Table 3

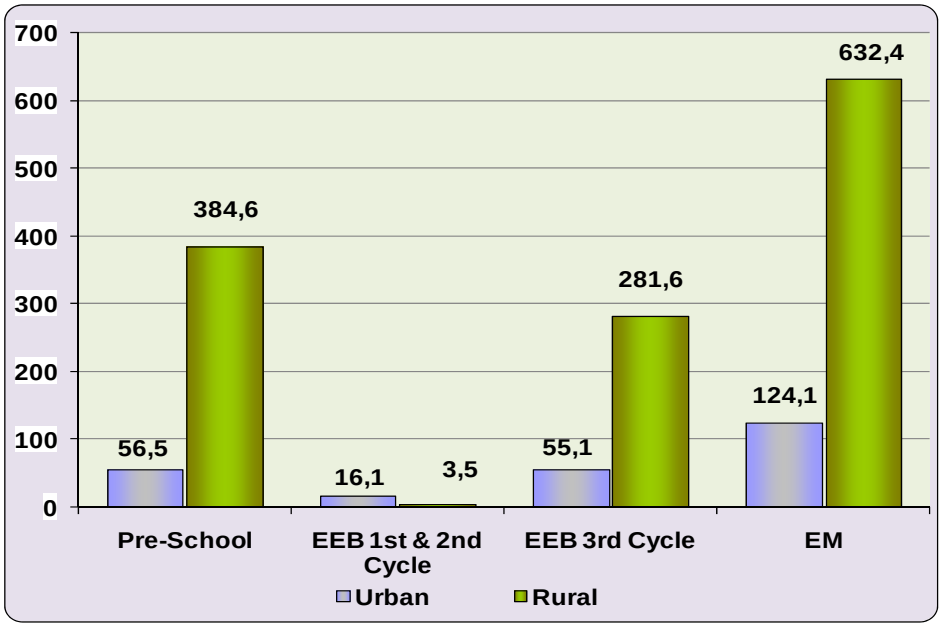
Number of schools by educational level, 1994 and 2006

Source: Authors' calculations based on information from MEC. 2006.

Graph 1

Percent change in enrollment by educational level and area of residence

1994-2006

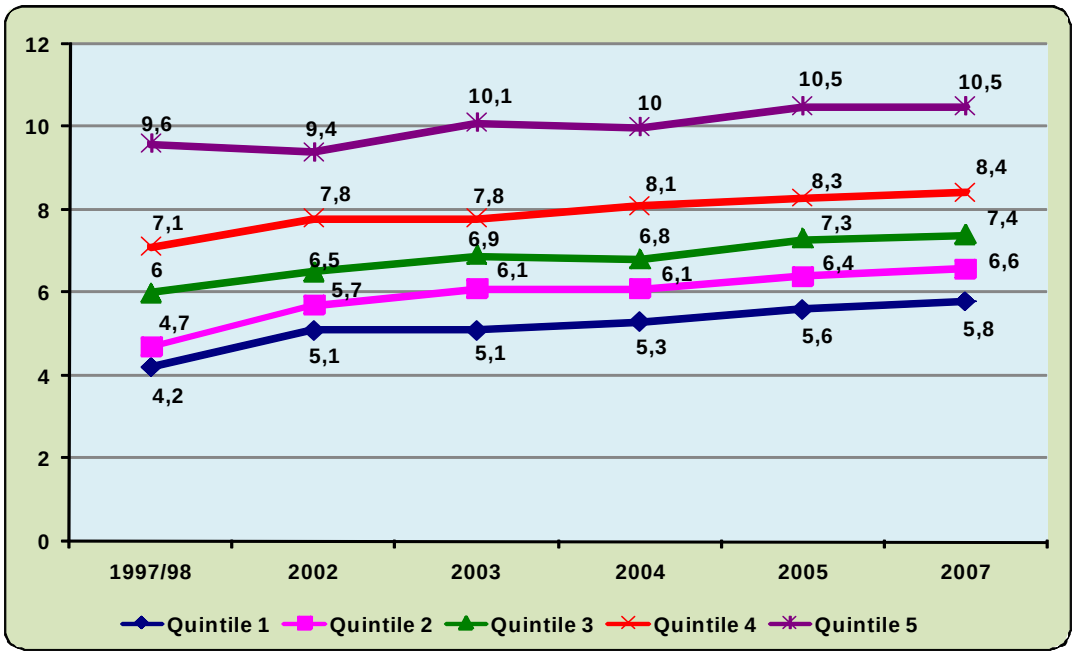


Source: MEC. 2006.

Educational Attainment

Graph 2

Years of study for population of age 15 and more, by income level.



Source: Authors' calculations based don information from DGEEC, EPH.

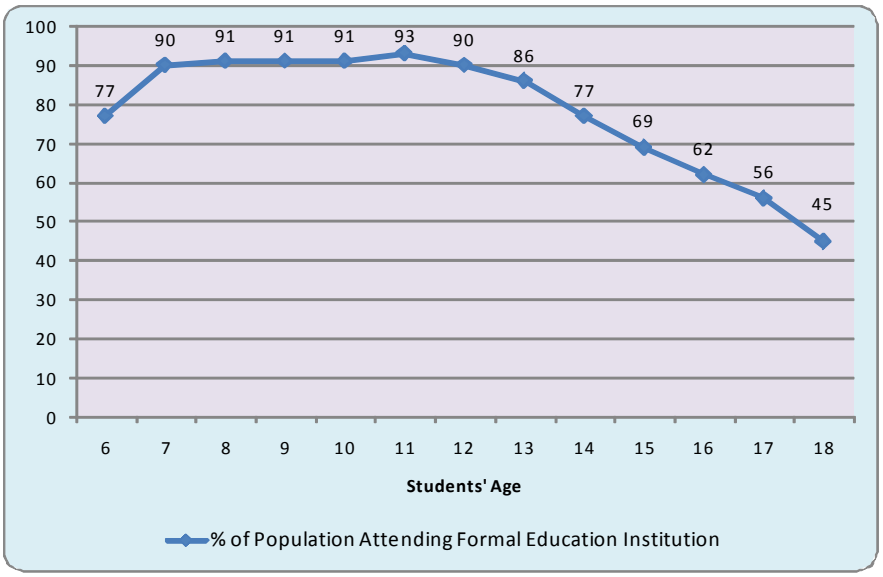
As shown in **Graph 2**, educational attainment among the 15 and older population has increased for all income levels over the last 10 years. As might be expected, educational

attainment increases with income. However, **Graph 2** also shows that the attainment gap has been narrowing as increases in poorer children's attainment have outpaced increases in richer children's attainment. However, the most recent data indicate that the top quintile still has almost 5 additional years of school compared with the bottom quintile.

Graph 3 shows attendance rates by age. Attendance rates through age 11 are high, averaging over 90% of children, and trail off with age. Among 18 year olds, only 45% attend formal educational institutions. (DGEEC. 2004)

Graph 3

Percentage of population attending formal education institutions Ages 6 to 18.



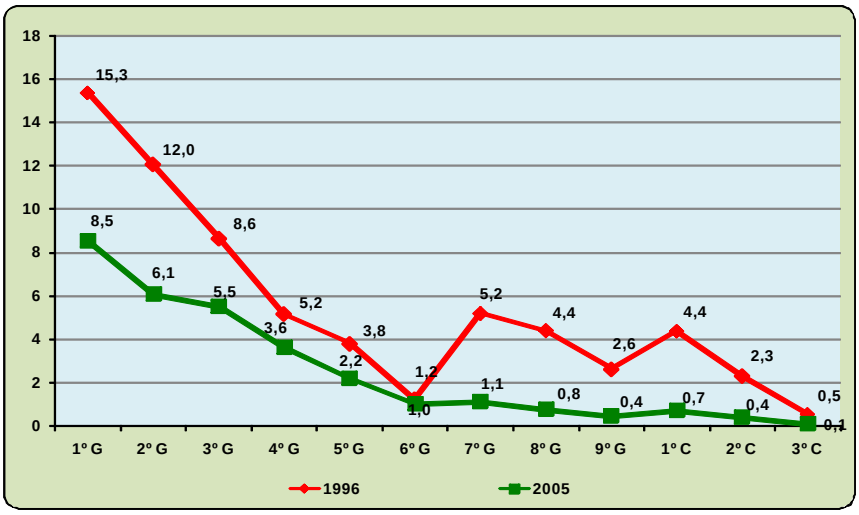
Source: DGEEC. 2004.

Repetition, drop-out, retention and graduation rate

Graph 4 shows the percentage of students that repeat each grade, comparing data from 1996 and 2005. As shown, repetition rates are very high in the lowest grades, and generally decrease over time. The graph also shows that repetition rates have declined between 1995 and 2005 for all grades. Nevertheless, high rates of grade repetition in the earlier grades continue to be a problem in Paraguay.

Graph 4

Percentage of students repeating grade, years 1996 and 2005.



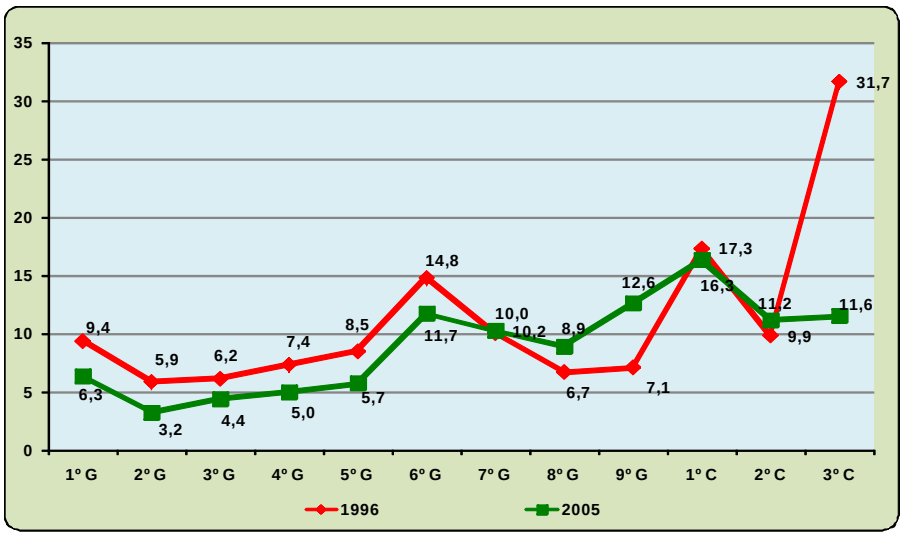
Observation: Data is available on repetitions for 3rd cycle of EEB and EM levels since 1996.

Source: MEC. 2006.

Graph 5 compares drop out rates by grade between 1996 and 2004. As shown, drop out rates generally increase over time, averaging around 10% per grade among older students. **Graph 5** also shows that generally there has been progress in reducing drop out rates. As might be expected, drop out rates are about 50% higher in rural areas than in urban areas **(Table 4).**

Graph 5

Percentage of drop-outs, years 1996 and 2005



Observation: data on school desertion available for 3rd cycle of Basic Education and Middle Education, since 1996.

Source: MEC. 2006.

Table 4

Percentage of drop-outs by educational level, 2006

Level	Total	Urban	Rural
EEB, 1st & 2nd Cycles	6.0%	4.6%	7.3%
EEB, 3rd Cycle	7.5%	6.4%	9.2%
EM	7.0%	6.4%	8.4%

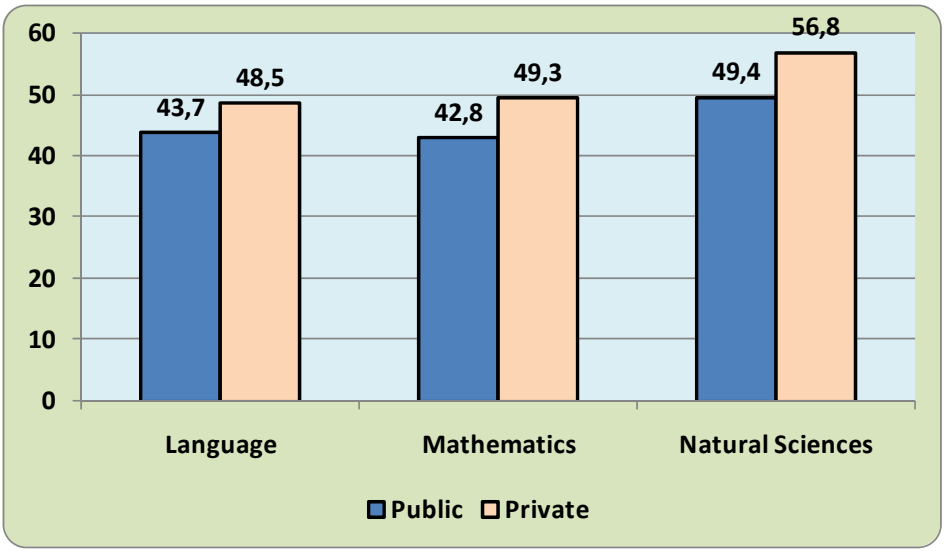
Source: Authors' calculations based on information from MEC. 2006.

Students' academic performance

Students' academic performance is measured through the national SNEPE test (Sistema Nacional de Evaluación del Proceso Educativo). Since 1995, SNEPE has tested representative samples of students nationwide at the end of each of the two education levels (EEB and EM). Tests are administered every couple of years and are given in mathematics, language, sciences and social studies. Tests results show low performance at both levels and in all subjects. For instance, test results from 6th grade students in 2004 (the last year for which results are available) show that on average students answered 44% of the mathematics questions correctly, 45% correct in communication, and 51% correct in natural sciences. Student scores are slightly higher in private institutions (**Graph 6**), and performance among students from rural versus urban areas is quite similar (**Graph 7**).

Graph 6

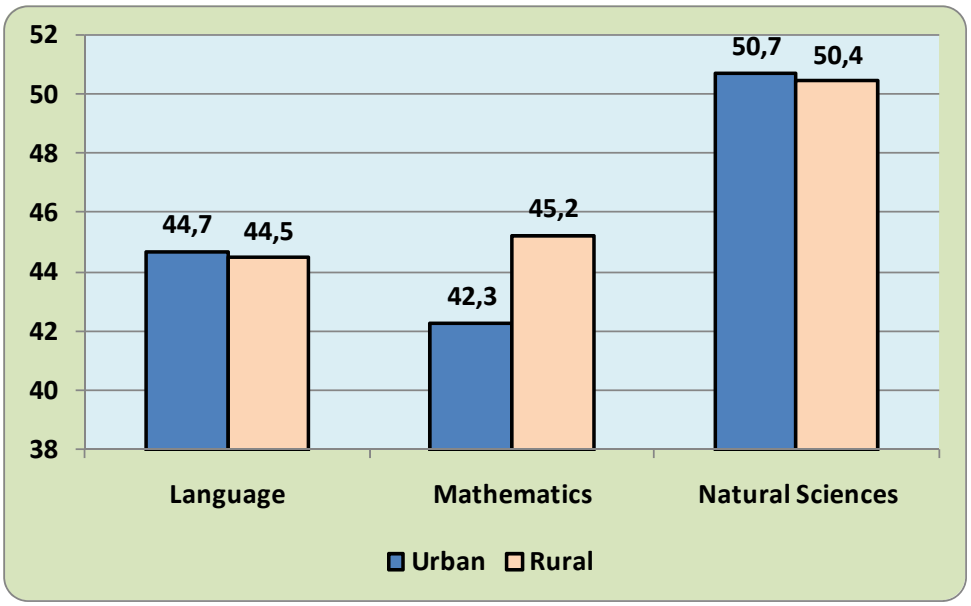
6th Grade SNEPE scores (% correct), by institution type and subject



Source: MEC. 2007.

Graph 7

6th Grade SNEPE scores (% correct), by geographic zone and subject



Source: MEC. 2007.

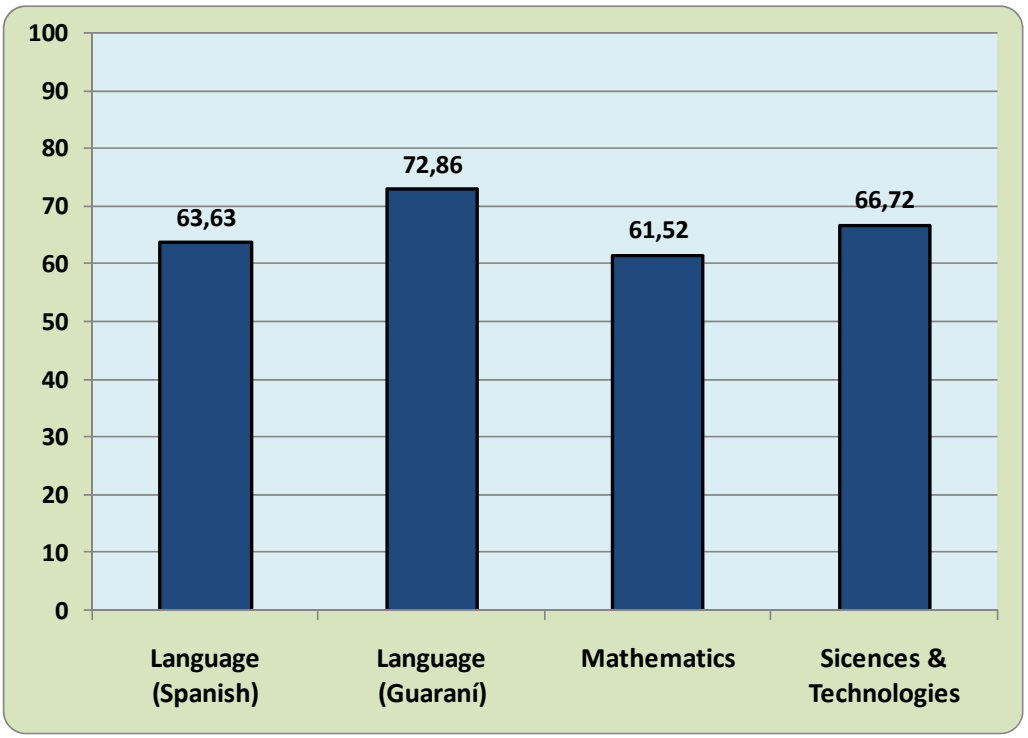
Teacher Training

One problem in Paraguay is the low quality of its teacher training. According to the World Bank (2003) the quality of Paraguay's Teacher Training Institutions (IFD) is low. Educators there lack academic knowledge and pedagogical skills. Libraries are obsolete and underutilized, and information technologies have not been adequately incorporated into the curriculum. Moreover, national studies of students completing their studies at IFDs show they typically lack conceptual knowledge in basic subjects such as Spanish and mathematics, and lack knowledge of teaching methodologies as well (see **Graph 8**). The last situation report on Paraguayan education (CONEC, 2007) attributes low student performance to the poor quality of Paraguay's teachers.

About 36 percent of Paraguay's public pre-school education teachers have received primary school training, 54% have been trained for other educational levels, and 11% never received professional training in education. Among EEB teachers, about 89% have been trained in their respective levels. However, about 7% of teachers in EEB and EM have not received training in their respective levels, and 30% of 3rd cycle of EEB and EM teachers has not been trained to teach at their respective level.

Graph 8

Performance of IFD's students in national tests (% correct)



Source: CONEC. 2007

Teacher Salaries

Average teachers' salaries in Paraguay have generally grown steadily over the period 1994 to 2008 (see **Table 5**). In addition to basic salaries, teachers receive a bonus paid after each five-year period, with amounts varying according to seniority and level of teacher's training.

Table 5

Average monthly teacher's salaries, 1994-2008 (current guaranies)

Year	Teachers Salaries	
	Pre-School and EEB	EM
1994	404,450	689,000
1995	489,400	795,600
1996	538,300	874,900
1997	538,300	874,900
1998	613,660	962,000
1999* **	669,994	1,050,335
2000	758,400	1,183,000
2001	758,400	1,183,000
2002	758,400	1,183,000
2003	758,400	1,183,000
2004	823,622	1,300,000
2005	823,622	1,300,000
2006	905,900	1,417,000
2007	980,000	1,456,000
2008	1,176,000	1,747,200

Source: Authors' calculations based on information from Ministry of Finance.

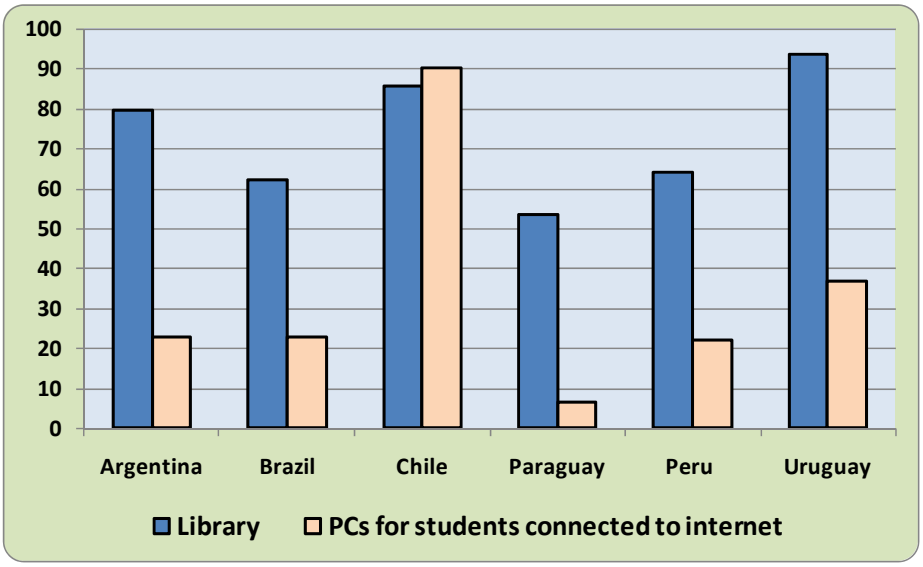
School Resources

Schools in Paraguay, particularly primary schools, are poorly equipped. According to World Education Indicators (UNESCO, 2008) only 53% of Paraguayan primary students attend institutions with libraries and only 7% have access to the internet at school. As shown in **Graph 9**, by regional standards these percentages are low.

Graph 9

Resources in Primary Schools

Percentage of students with access to library and PCs with internet connection



Source: UNESCO, 2008a. UNESCO Institute for Statistics. World Education Indicators (WEI). A Look Inside Primary Schools (Una Mirada al Interior de las escuelas primarias). http://www.uis.unesco.org/template/pdf/wei/sps/Report.pdf

Public Investments in Education

In Paraguay, about 90 percent of the funds for publically-funded education originate with the Ministry of Education and Culture (MEC). Over the last 15 years, these investments have grown from about 3.3 percent to about 4.6 percent of GDP (see **Table 6**).

Table 6

MEC's budget as % of GDP (million current guaranies)

Notes:

(1) – GDP

(2) – National Budget

(3) – Ministry of Education and Culture (MEC). Approved Budget.

GDP 1994-2003: National Accounts System. Serie 1991-2004 (Base: 1994). Central Bank of Paraguay.

GDP 2004-2006: Estimation from Central Bank.

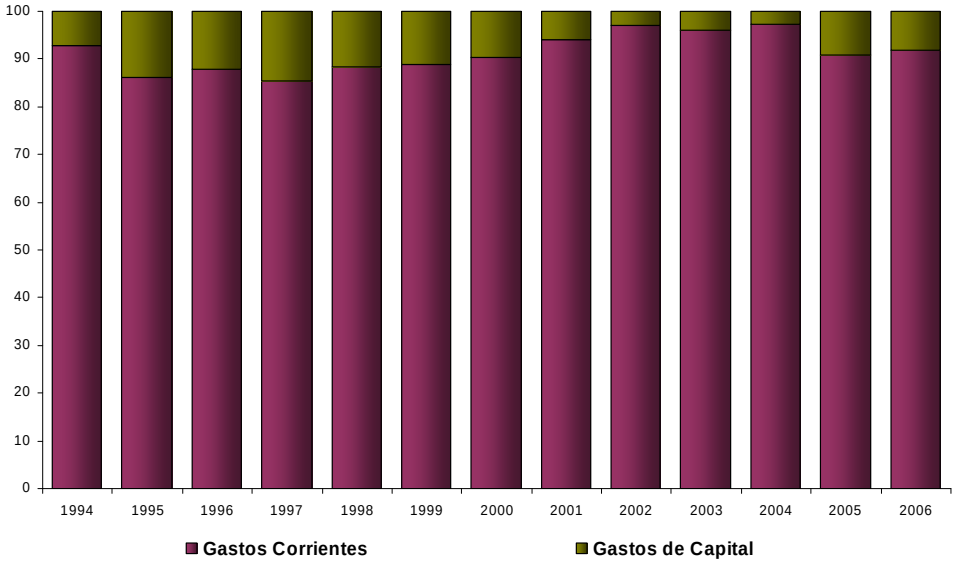
GDP 2007: National Accounts Bulletin (Estimated growth of GDP for year 2006: 5%)

Source: Authors' calculations based on information from Ministry of Finance and Ministry of Education and Culture.

More than 90% of MEC's education budget is used for current spending, with the balance financing capital expenditures. **Graph 10** shows the breakdown between current and capital expenditures in education between 1994 and 2006.

Graph 10

MEC's budget distribution, current spending and capital investments. 1994-2006.



Source: National General Budget Law (Ley del Presupuesto General de Gastos de la Nación), corresponding to MEC.

4. Benchmarking

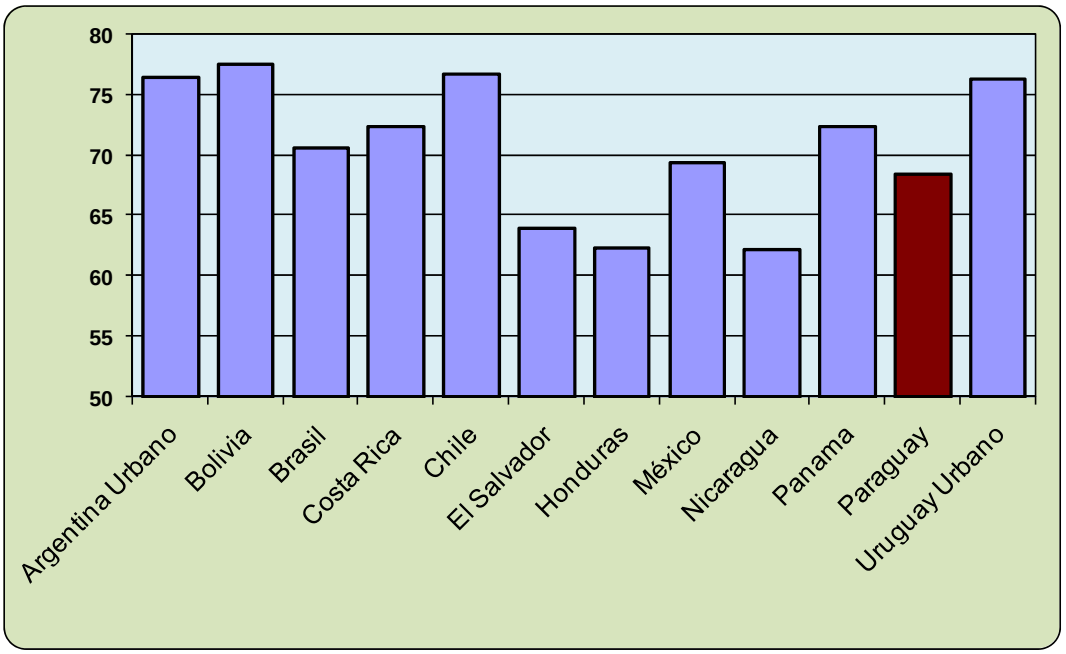
This section places Paraguay's educational system within a regional context. That is: how does Paraguay's system, and the performance of its students, compare with other countries in Latin America? For this, we draw primarily on results from the Second Regional Comparative and Explicative Study from 2006 (SERCE) released in 2008.

Enrollment and Attainment

First, we compare Paraguay's school enrollment rates with those in other countries in the region. As shown in **Graph 11**, at 69 percent Paraguay is quite typical for the region. A second point of comparison is the percentage of students that are at least 2 grades behind where they should be based on their age. As shown in **Graph 12**, Paraguay has a very high percentage of students in this category – higher than all countries represented in the study with the exception of Nicaragua. Finally, we compare the percentage of the population 15 years old or more with low educational attainment, as measured by not having completed primary school. As shown in **Graph 13**, at 30 percent, Paraguay's rate is about equal to the average of Latin American countries, although there is great variation among Latin American countries.

Graph 11

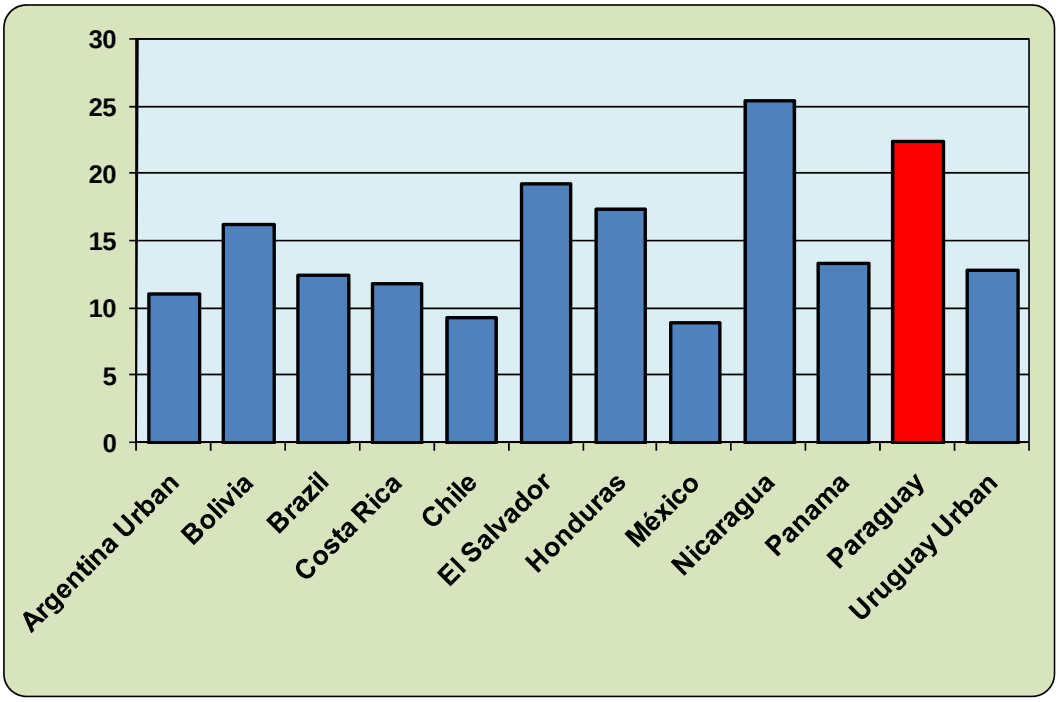
Enrollment rate



Source: UNESCO. 2008.

Graph 12

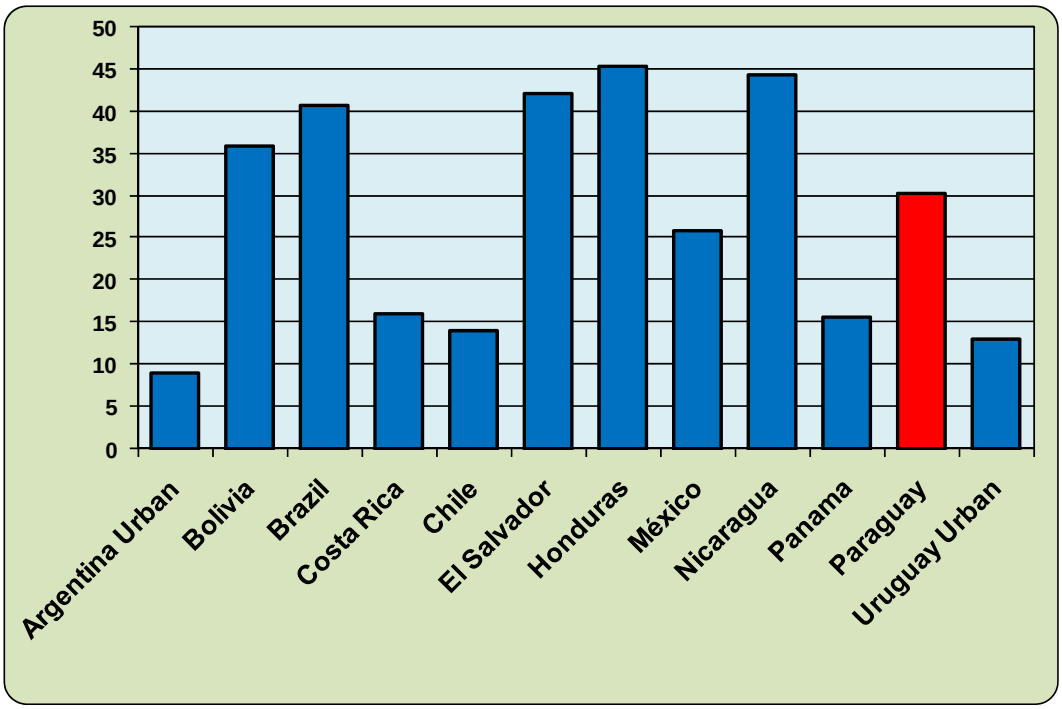
Percent of students at least two years behind in School



Source: UNESCO.2008.

Graph 13

Population 15 years old or more with incomplete primary education



Source: UNESCO.2008.

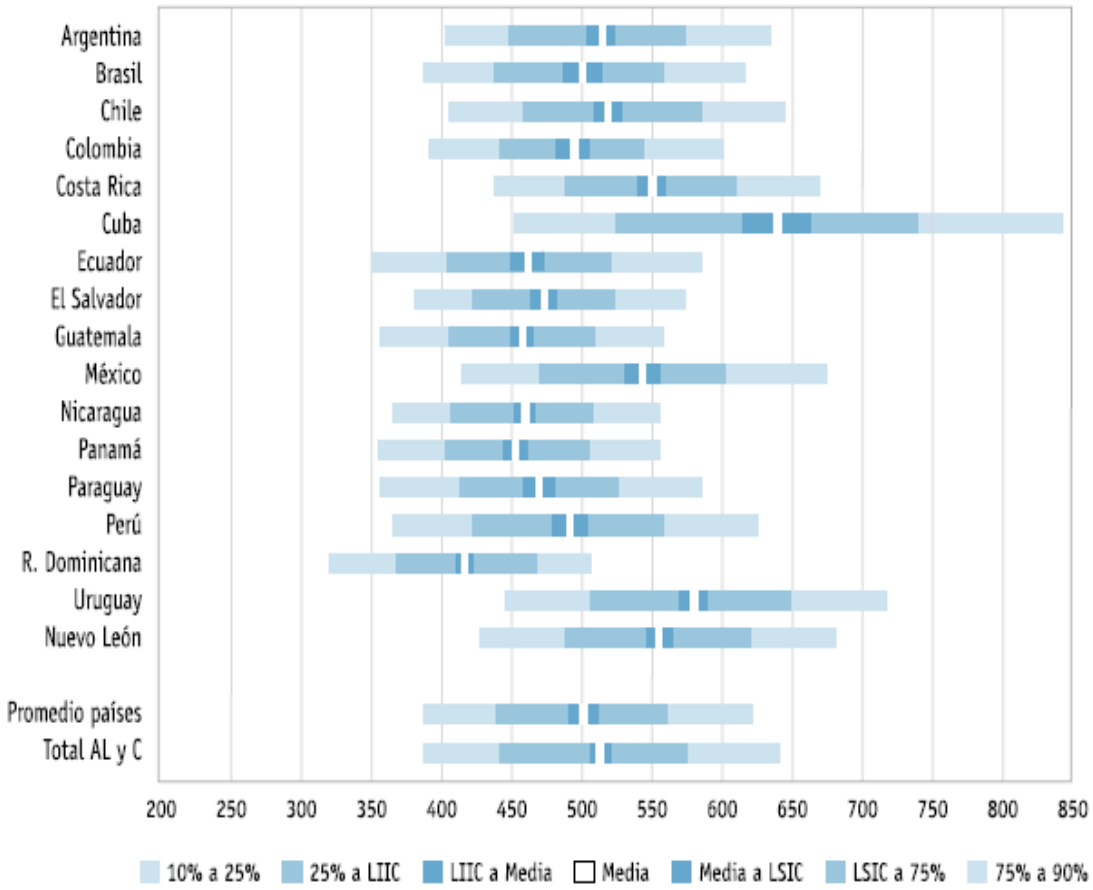
Student Performance

Test scores from SERCE (available on students from Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Mexico, Nicaragua, Panama, Paraguay, Peru, Dominican Republic and Uruguay, as well as from the Mexican State of Nueva Leon) provide comparative information on student performance across the region. In 2006, tests were given to representative samples of both third and sixth graders measuring their competency in language and mathematics. As shown in **Graph 14** below, average scores among sixth graders in math are similar to scores in Guatemala and El Salvador, slightly below scores in Peru, and significantly below the average of 500 points for the region. Scores also reveal that over 70 percent of 6th graders fail to reach the standard of performance expected of their age; this percentage is high by regional standards, and is similar to percentages found in Ecuador, El Salvador, and Guatemala (**Graph 15**). Performance among 6th graders in reading shows a very similar pattern: average test scores are significantly below the regional average of 500, with again scores looking similar to those in Ecuador and Guatemala, but lower than in El Salvador, Nicaragua, Panama, and Peru (**Graph 16**). Again, over 70 percent of students fail to meet expected performance levels in reading, a percentage

significantly above the regional average, and similar to underperformance levels in Ecuador, Guatemala, and Nicaragua (**Graph 17**).

Graph 14

Performance average and variability in Mathematics, 6th Grade students

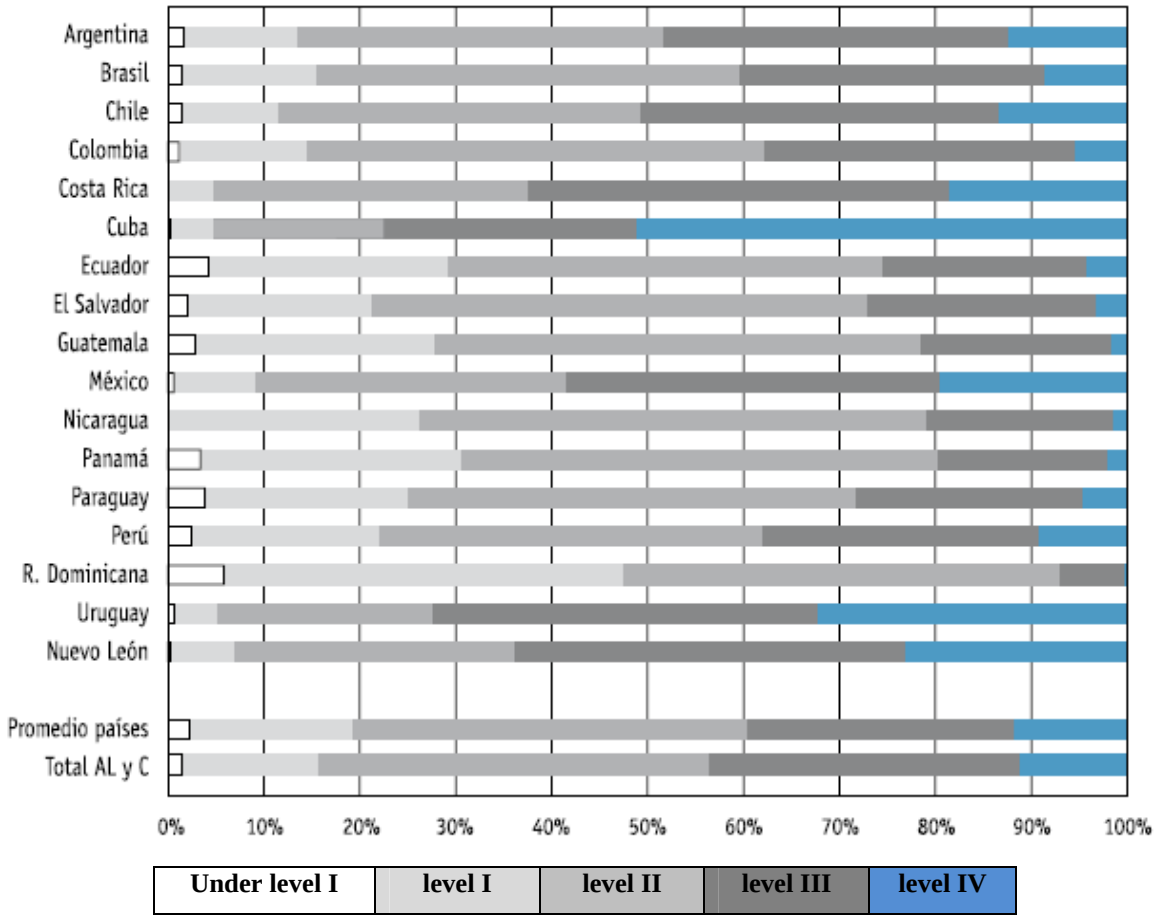


LIIC: Límite inferior del intervalo de confianza con un $\alpha = 0,05$.
LSIC: Límite superior del intervalo de confianza con un $\alpha = 0,05$.
Las barras representan los resultados del 80% de los estudiantes de cada país que se encuentran entre el percentil 10 y el percentil 90. Es decir, el extremo derecho de cada barra representa el puntaje de los estudiantes que se ubican en el percentil 90 y el extremo izquierdo, el de los que están en el 10. A mayor distancia entre estos dos puntos, mayor variabilidad en los desempeños de los estudiantes.
La media se identifica con la línea blanca central. El intervalo de confianza, con la línea más oscura que rodea la media, y expresa los valores posibles de ésta.

Source: UNESCO. 2008. SERCE. http://unesdoc.unesco.org/images/0016/001606/160660S.pdf. Page 80.

Graph 15

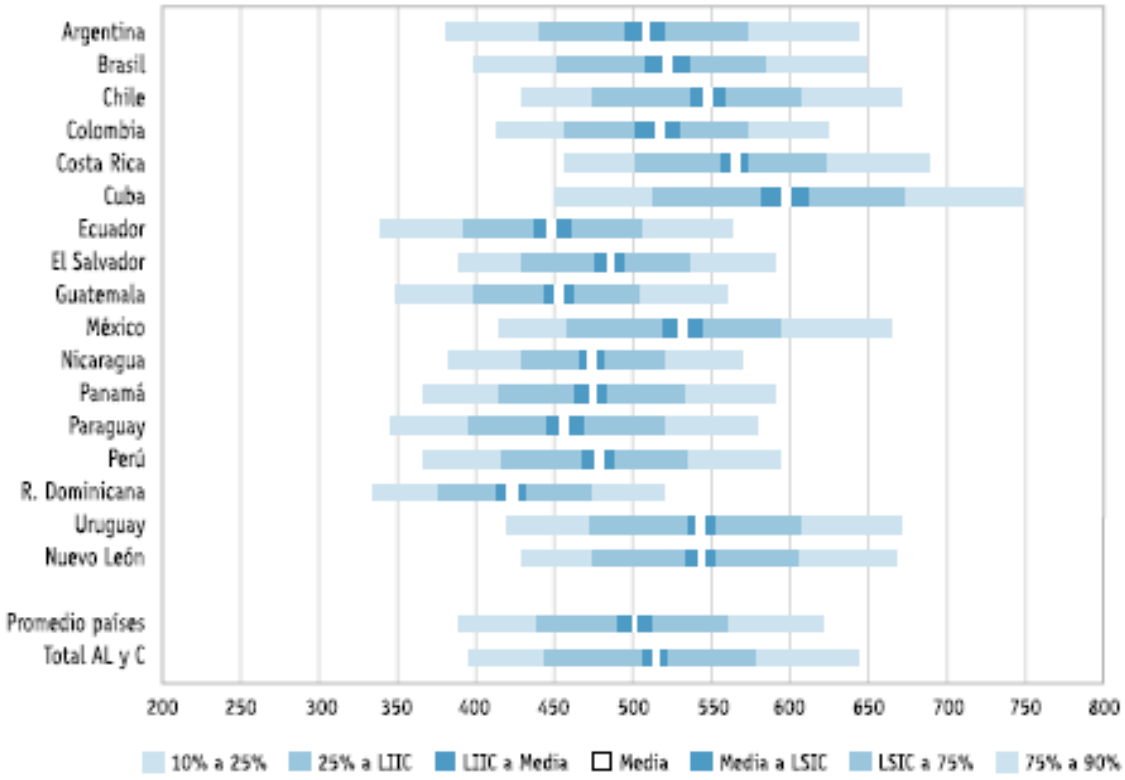
Percentage of 6th Grade Students by performance level in Mathematics



Source: Unesco. 2008. SERCE. http://unesdoc.unesco.org/images/0016/001606/160660S.pdf. Page 84.

Graph 16

Performance Average and variability in Reading, 6th Grade students

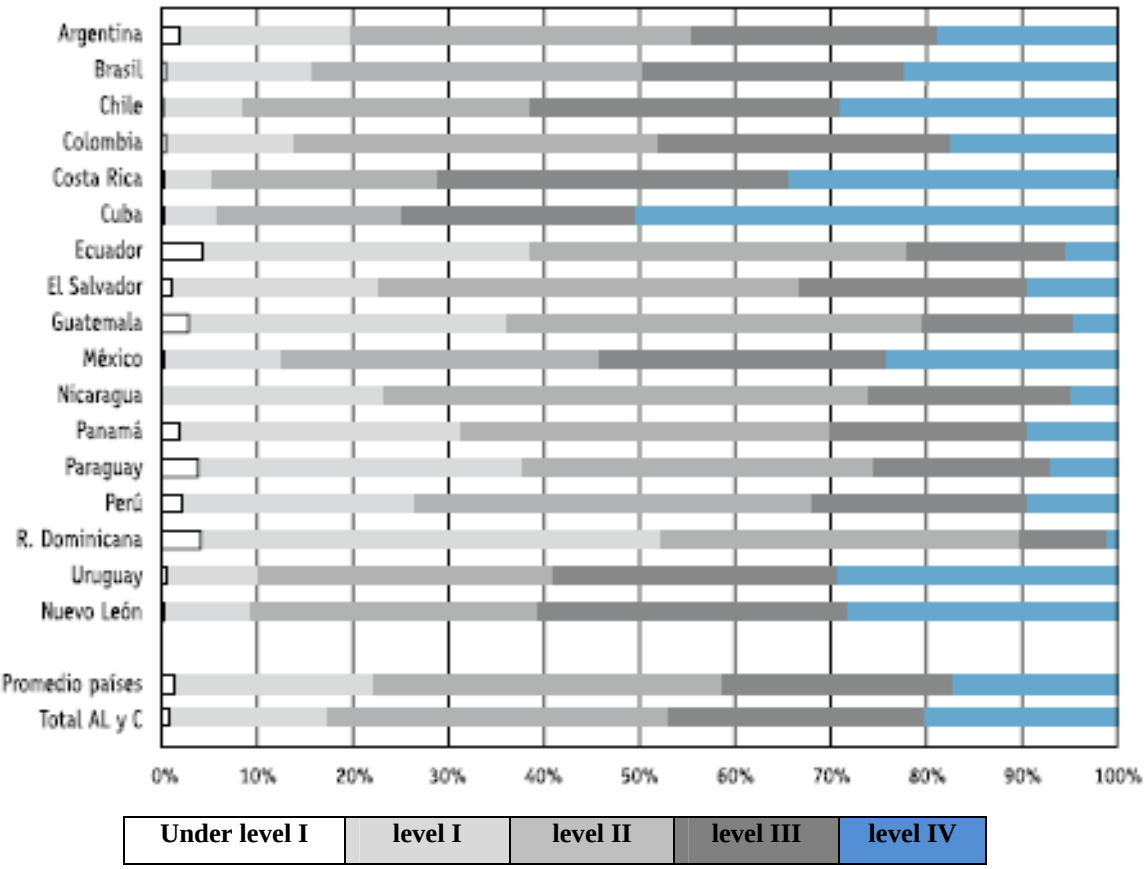


LIIC: Límite inferior del intervalo de confianza con un $\alpha = 0,05$.
LSIC: Límite superior del intervalo de confianza con un $\alpha = 0,05$.
Las barras representan los resultados del 80% de los estudiantes de cada país que se encuentran entre el percentil 10 y el percentil 90. Es decir, el extremo derecho de cada barra representa el puntaje de los estudiantes que se ubican en el percentil 90 y el extremo izquierdo, el de los que están en el 10. A mayor distancia entre estos dos puntos, mayor variabilidad en los desempeños de los estudiantes.
La media se identifica con la línea blanca central. El intervalo de confianza, con la línea más oscura que rodea la media, y expresa los valores posibles de esta.

Source: Unesco. 2008. SERCE. http://unesdoc.unesco.org/images/0016/001606/160660S.pdf. Page 110.

Graph 17

Percentage of 6th Grade Students, by performance level in Reading (%)



Source: UNESCO. 2008. SERCE. http://unesdoc.unesco.org/images/0016/001606/160660S.pdf. Page 113.

In addition to low overall performance and a very high percentage of underperforming students, Paraguay also a very small percentage of students that exceed standards (categorized as Level IV performance by SERCE). As shown in **Table 7** below, across grades and subject matter, only 5 to 10 percent of students exceed standards, a pattern also found in Peru, Colombia, El Salvador, and Panama. **Table 8** presents the same information, except on the percentage of students scoring in the Level 1 range (significantly below standards). **Table 8** shows that particularly among third graders, a very high percentage of students in Paraguay are performing significantly below standards (about half of all students in third grade, and about one quarter to 40 percent in the sixth grade).

Thus, compared with neighboring countries (Chile, Argentina, Uruguay, and Brazil), student performance in Paraguay is particularly poor – in terms of average performance, in terms of the percentage of students that significantly underperform, and in terms of the percentage of students that perform significantly above average. Rather, student performance

in Paraguay is better compared with performance in Ecuador, El Salvador, Nicaragua, Peru, and Colombia.

Table 7

Percent of students obtaining Level IV performance on SERCE

Source: UNESCO. 2008.

Table 8

Percentage of students obtaining Level I performances or less on SERCE

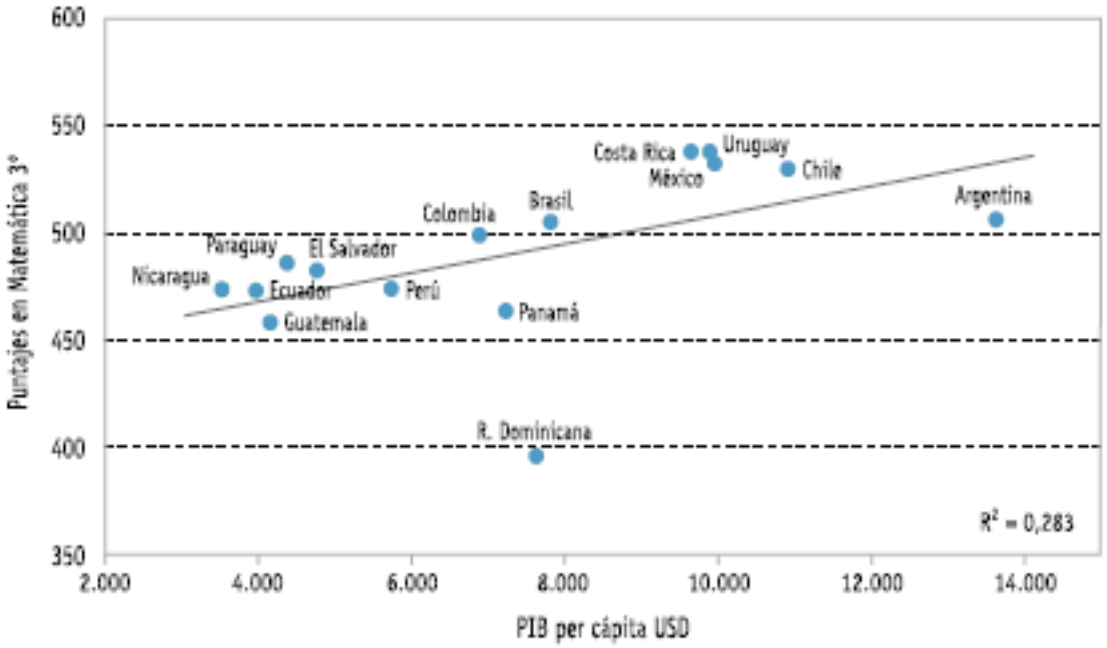
Source: UNESCO. 2008.

That raises the question of how Paraguay, taking into account its income and socioeconomic challenges, compares with other countries. Given the country's income, performance in Paraguay is similar to what could be predicted based on student performance throughout the region. This is shown in **Graph 18** below, which plots test result by per capita income in the region. We see that particularly in mathematics, regional test scores closely track country income. Performance in reading is more variable, but Paraguay's performance in reading is still what might be predicted based strictly on its income.

Graph 18

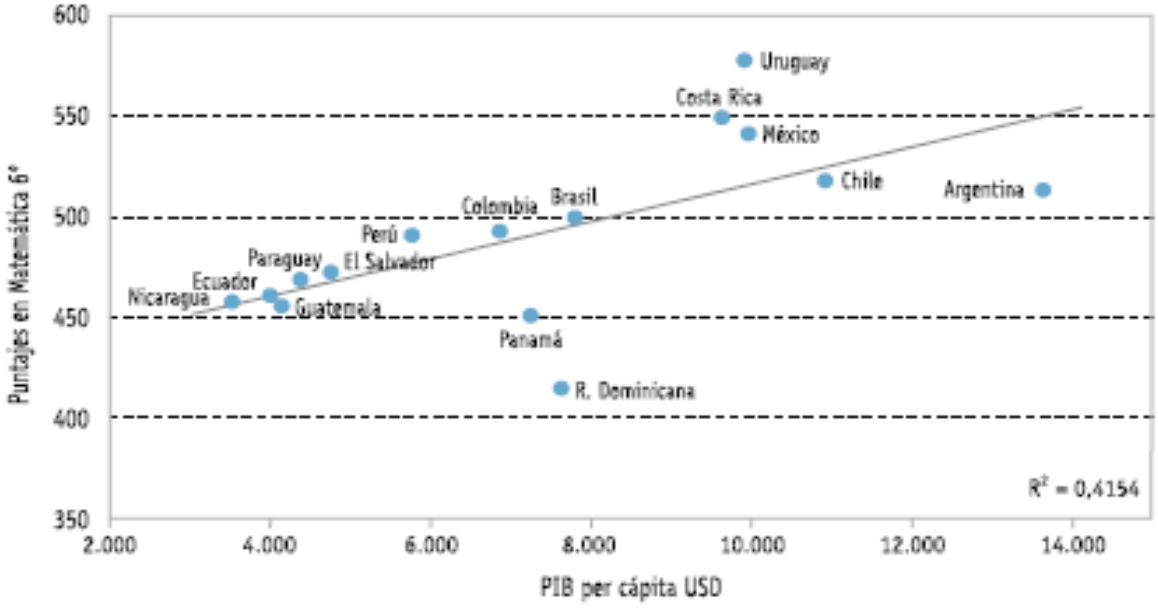
Relations among students' performance and GDP per capita.

a) Mathematics 3rd Grade



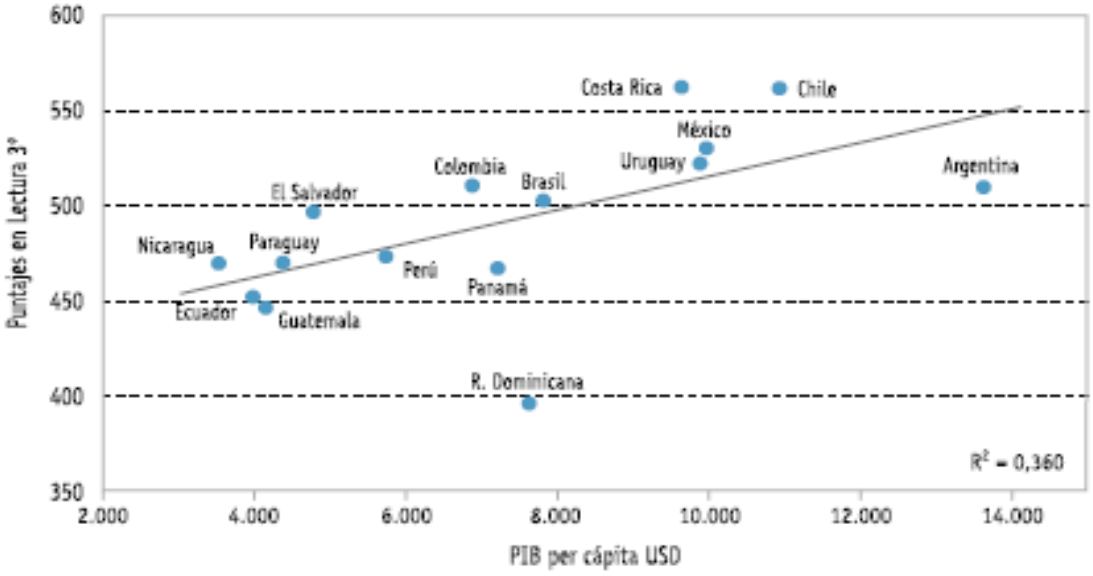
Source: UNESCO. 2008. SERCE. http://unesdoc.unesco.org/images/0016/001606/160660S.pdf. Page 133

b) Mathematics 6th Grade



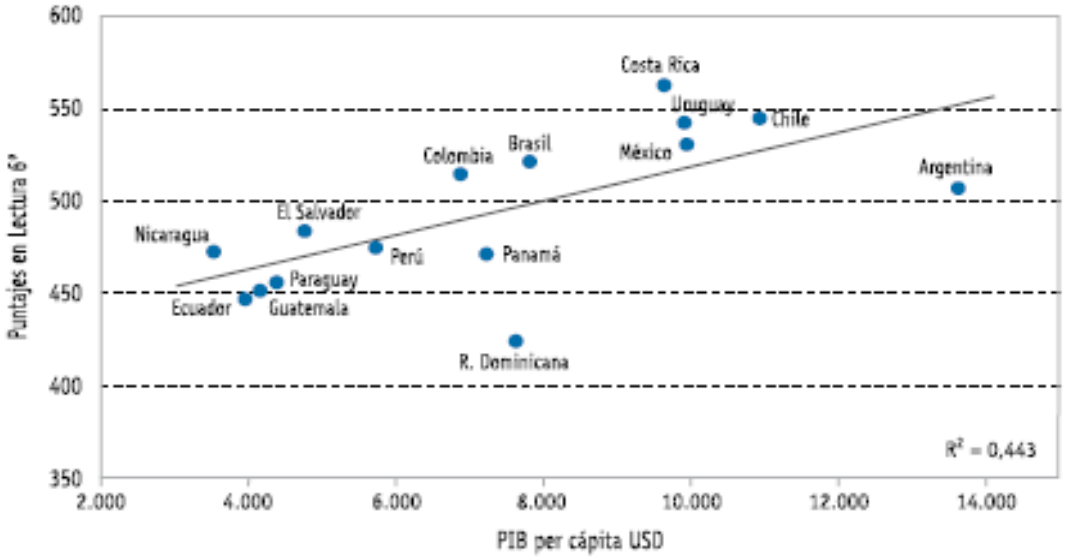
Source: UNESCO. 2008. SERCE. http://unesdoc.unesco.org/images/0016/001606/160660S.pdf. Page 134

c) Reading 3rd Grade



Source: UNESCO. 2008. SERCE. http://unesdoc.unesco.org/images/0016/001606/160660S.pdf. Page 134

d) Reading 6th Grade



Source: UNESCO. 2008. SERCE. http://unesdoc.unesco.org/images/0016/001606/160660S.pdf. Page 134

In terms of other socioeconomic comparisons with countries in the region, results from SERCE questionnaires indicate that among 6th graders, lower national performance also tends to be associated with higher indicators of socioeconomic disadvantage, such as a higher percentage of students working outside of the house (see Grafico 2.23, UNESCO, 2008). However, comparing another typical indicator of socioeconomic status -- parental education --

parents in Paraguay on average have more education that is typical in the region (see Grafico 2.25, UNESCO, 2008).

Thus, Paraguay's low student performance, when put in the context of measures of its socioeconomic development, is fairly predictable. While on the one hand this makes the poor quality of Paraguay's educational system understandable, it also means that it is even more imperative that Paraguay seek to identify the educational strategies and investments that are associated with higher performance within the country. To this end the following section describes the method we undertake to address this, followed by a discussion of our findings.

4. Methodology and Data Analysis

In this section we seek to measure the extent to which differences in performance among Paraguay's 6th graders can be attributed to differences in school-level resources and practices, compared with differences in student characteristics. The purpose of this analysis is to identify the policy-relevant factors associated with student performance.

We should first note that measuring human capital acquisition among individuals is difficult. Previously it was typically measured by schooling attainment. But recent studies have shown that cognitive skills, more than schooling attained, is a better predictor of individual productivity (Hanushek & Kimko, 2000), and research has now established an important link between cognitive skills (measured by test scores) and future career success (see Hanushek & Luque, 2003 for a discussion). A recent cross national study by Hanushek and Wöβmann (2007) also concluded that measures of the quality of education in a country better predicts changes in income distribution and economic growth then does the quantity of education attained in these countries. For these reasons, our analysis focuses on qualitative measures of educational attainment.

To this end, in this study we measure educational quality through student test scores using data obtained from the SERCE (Paraguay has never participated in the international PISA, PIRLS, or TIMSS tests). We also discuss (without presenting) results from a similar study we undertook using country-level SNEPE test scores. To analyze the quality of Paraguay's educational system, we analyzed data from SERCE 6th grade students' performance using individuals' SERCE test scores in language and mathematics.

Test Scores

The Second Regional Comparative and Explanatory Study (SERCE) gathered information on the performance of 200,000 third and sixth graders in a range of subjects across 16 Latin America and Caribbean countries; it also collected extensive information on the students, their family, and the schools they attended. To assess the student performance, SERCE tests were based on the common subjects covered in the curricula of the participating countries, and questions were designed to test knowledge and thinking processes. SERCE categorizes test scores into one of 4 "levels", with Level 4 demonstrating advanced ability in the subject, and Level 1 indicating very basic ability in the subject.

We consider the sixth grade (rather than third grade) to be a key time to assess the school system's effectiveness with respect to its students: students have been in school for at least six years; they have likely attended a single school (which as discussed below is important); students should be developing more sophisticated academic skills that present a better assessment of educational quality; and the participation rate in Paraguay among 6th graders is above 90 percent (beginning to drop off somewhat quickly for higher grades), thus largely avoiding problems of self selection.

Through SERCE we obtained detailed student-level data from a questionnaire that students and their parents filled out prior to taking the test. In addition to their test score, through this questionnaire we also know enough about the student and the student's circumstances to give us greater confidence in our ability to link test scores with school characteristics, holding student characteristics constant. We hypothesize that student performance on the SERCE is influenced by the following range of factors:

- **Family background:**

Families with more resources and human capital can influence student achievement through educationally-relevant investments. We measure family socioeconomic background characteristics in several ways. One, we create a dummy variable where Spanish or Portuguese is spoken at home, as reported on the student questionnaire (QA6_Item_4=1)[3]. We also create dummies where parents report low educational attainment for the mother (QF_Item_2_1_b=1 or QF_Item_2_2_b=1), or high educational attainment (QF_Item_2_6_b=1 or QF_Item_2_7_b=1)[4], and another where the family reports less than

[3]Parents also report the first language each student spoke, but parents' response rate on this question is lower than the students, so we used the students' data. The correlation between these two variables is .64.

[4]Fathers' educational attainment was also reported, with a correlation with the mothers' attainment of .48 for low and .54 for high educational attainment.

10 books in the household (QF_Item_11<3). We also have information on the student's household size (QF_Item_6_1+QF_Item_6_2), and whether or not the family reports the availability of potable water in the household (QF_Item_9_2=1). Finally, as a measure of family engagement in the student's school, we create a dummy where the family reports always attending meetings at the school (QF_Item_15_2=1)[5].

- **Student background:**

To account for student background characteristics, we control for his or her age (this varies between 8 and 16) and gender[6]. We also create a dummy variable where the parents report that the student did not attend preschool (QF_Item_14=1), and for students who report having repeated more than 1 grade (QA6_Item_14>1). We also estimate the average number of hours/week the student reports working (QA6_Item_18 * QA6_Item_19).

- **Teacher background:**

For each teacher, we know the teacher's age (QP_Item_2) and gender (QP_Item_1). We created a dummy variable where the teacher has participated in a teacher formation program (QP_Item_11=1), and another for teachers with high levels of educational achievement (QP_Item_12=5 or 6) or low educational achievement (QP_Item_12=1 or 2)

- **School and Principal characteristics:**

We create dummy variables where principals low teacher expectations (QD_Item_27_1=3 or 4) or teacher absences (QD_Item_27_8=3 or 4) as characteristic of their school.[7] To measure school autonomy and level of decentralization of school, we created dummy variables where principals reported that they were responsible for hiring teachers ((QD_Item_15_1=4 or 5) and where they determine teachers' salaries (QD_Item_15_3=3, 4 and 5). We also created a dummy variable where the principal reports that criteria for student evaluation are centrally determined (QD_Item_15_7=1). We also create dummies for urban public schools (AdmRur=1), and for urban private schools (AdmRur=2).

The analytical approach is to examine the association between each student's personal and family background characteristics as well as characteristics of the schools they

[5]Surprisingly this variable has a fairly low correlation (.37) with parents' response to whether or not they have participated in school activities this year (QF_Item_15_1=1).
[6]Nine students in the data base were over age 16, and these students were eliminated from the study.
[7]Principals also answered this question, but at a lower response rate than did the teachers. Correlation: 42.

attend, and the student's performance on both the 6th grade language and mathematics SERCE tests.

Two main methodological concerns arise with the approach and data discussed above for estimating the importance of various factors on students' test scores. First, the data described above are problematic for evaluative purposes in that test scores reflect the accumulation of all the learning in that student's life, whereas the student, family and school characteristics are measured for a point in time. This is particularly true with school resources, since school characteristics, such as classroom size, is for the school year 2006. We thus must assume that all of these student, family, and school characteristics are representative of the characteristics of family, student and school environment in which the student grew up. For students who have not changed schools, this is a reasonable assumption. For students who have changed schools –particularly for those who may have switched from a public to a private school, or vice versa– this is not a reasonable assumption. However, since we have only one year of school "inputs", we have no choice but to make this assumption. Fortunately, in Paraguay sixth grade students typically attend schools that begin in kindergarten, so as long as students have not changed schools, their sixth grade school will be the only school they have attended. However as discussed earlier in the paper, school characteristics may have changed during these six years, and we should keep this in mind. Yet unless one has reason to believe that the explanatory variables will be biased in one direction or another, the result should be that ßs are unbiased but inefficient estimators.

A second problem this study faces is establishing that the $ß_s$ represent a causal relationship with test scores, rather than reflecting omitted variables. Imagine that high SES students obtain higher scores for reasons of unobserved background characteristics, and low SES students achieve lower scores for the same reason. If these unobserved characteristics are correlated with the school characteristics –stronger background characteristics are correlated with enrollment in schools with better resources, for instance– then the significance of the unobserved factors will be captured in the $ß_s$ of the school factors, and the importance of school characteristics in explaining test scores gaps will be overstated. This problem of self selection is the most important shortcoming of this study.

One method for reducing this problem of self selection is to take account of the nested structure of observations (individuals are not randomly assigned to schools, and thus school variables are not truly independent of test scores) by using multi-level statistical techniques. The use of hierarchical linear models (HLM) accounts for this structural feature

of the data by permitting observations within a school to be correlated with one another. To illustrate, take the following general linear model:

(1) $y_{it} = ß_0 + ß_1X_{1ij} + ß_2X_{2ij} + \ldots\ldots + ß_mX_{mij} + r_{ij}$,

where

i is the index for the individual,

j is the index for the school,

y is a continuous outcome variable measuring students' achievement or growth,

X is a set of m independent variables associated with individuals, and

r is the error term where $r_{ij} \sim N(0, \sigma^2)$.

Let W be a set of n school-level factors associated with the school j attended by individual i, that influences β_0 (the intercept) for each school.[8] The equation:

(2) $ß_{0j} = \gamma_{00} + \gamma_{01}W_{1j} + \ldots + \gamma_{0n}W_{nj} + \mu_{oj}$,

models this assumption. If the X variables are all centered on the grand mean for all students, then $ß_{0j}$, the intercept $ß_0$ for each school j, is the school mean score, adjusted for the characteristics of students in the school. The random element μ_{oj} is common across students in a school. Combining (1) and (2) results in:

(3) $y_{it} = \gamma_{00} + \gamma_{01}W_{1j} + \ldots + \gamma_{0n}W_{nj} + \mu_{oj} + ß_1X_{1ij} + ß_2X_{2ij} + \ldots\ldots + ß_mX_{mij} + r_{ij}$.

Equation (3) calls for a maximum likelihood estimation technique since the error term ($\mu_{oj} + r_{ij}$), and its variance is school-specific. HLM uses maximum likelihood, and thus provides better and more efficient estimates than simple linear regressions does.

The results presented below are based on multivariate regression analyses using a two-level hierarchical linear modeling (HLM) to take account of the clustering of students in schools in non-random ways (the second level is the student's school). The SERCE data do not include enough classes within the same school to permit a three level hierarchical analysis, which would take account of the nesting of classes within each school. For this reason, school-level features are entered at the classroom (second) level.

The Paraguayan SERCE data includes data on 4,675 sixth grade students; however, for only 4,307 of these students are there language test score data, and for only 4,362 math

[8]We might also conjecture that the slope estimates in (3) differ according to individual-level factors as well.

test score data (in theory the same students take both tests). Additionally, the SERCE data include quite a bit of missing information from students, students' parents, teachers, and/or principals. In the end, taking missing data into account, our analysis is based on the 1,601 students who took the SERCE language test and for whom complete data exist, and the 1,551 students who took the SERCE math test and for whom complete data exist (see **Table 9**).

Table 9 below presents summary data on all the students who took the 2006 SERCE, and compares this will the subset of those used in this study. Column 1 in **Table 9** shows the number of valid cases for each variable out of the 4,675 total cases in the SERCE 6th grade data set. Column 2 shows the average (weighted) value for all of the 6th grade students in the SERCE data set. For example, the average math score was 469 and the average language score was 457. Column 3 shows the average value of each variable among the 1,601 students used in the analysis based on language test scores, and the last column shows the average value of each variable among the 1,551 students used in the analysis based on math test scores. For example, the average language test score among those students used in this study is 466, and the average math score is 478. Thus, on average the students used in this study have slightly higher test scores than the sample in Paraguay that took the SERCE test. As shown in **Table 9**, they are also slightly less likely to have repeated a grade, on average they are more likely to have a mother with low *and* high educational attainment, they report a household size slightly smaller than the population as a whole, and their teachers report a slightly higher level of educational attainment. Otherwise, the subset of students used in this study looks quite similar to the representative sample that took the SERCE test.

Table 9

Descriptive Statistics (all data weighted by student weight)

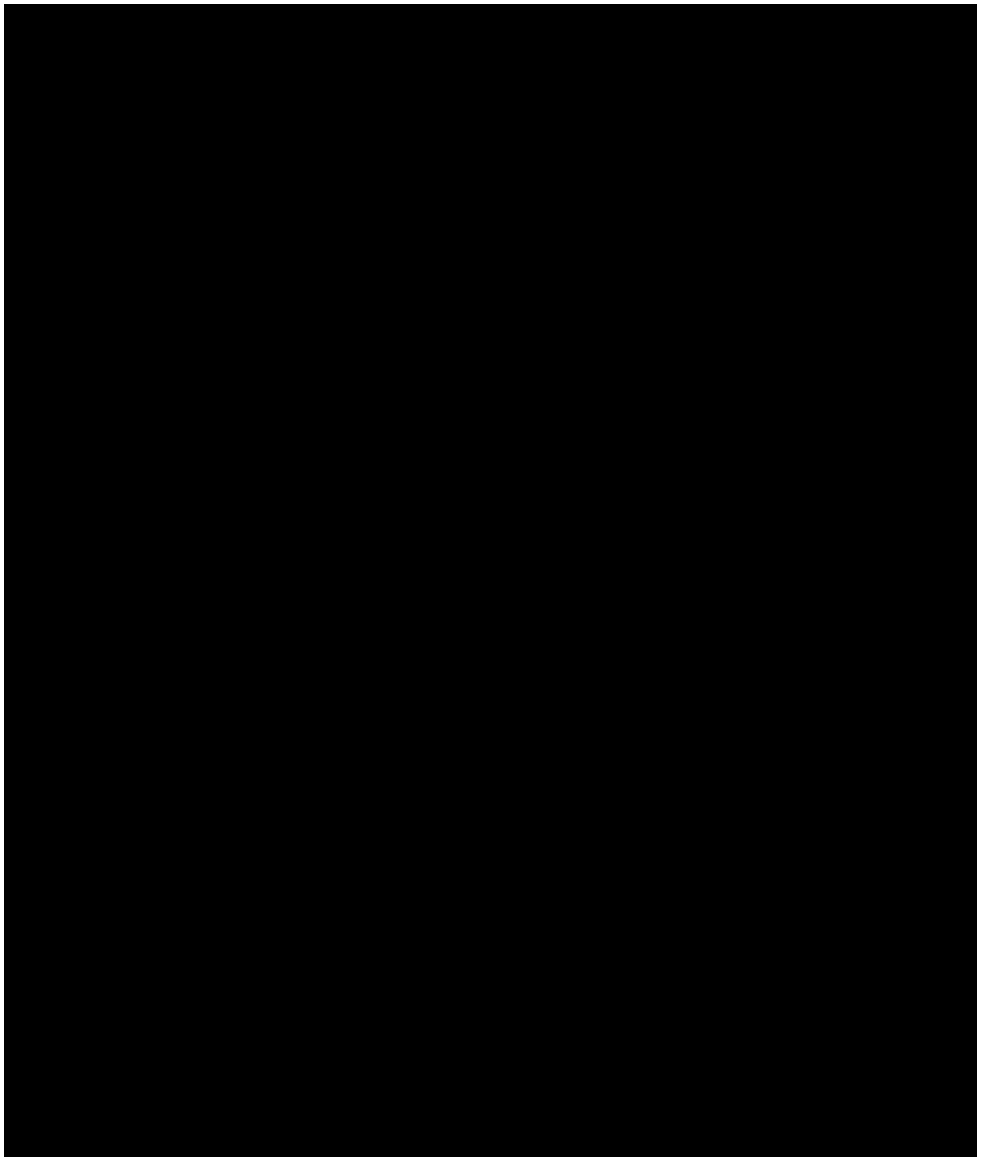


Table 10

HLM results on the decomposition of variance in students' test scores

Table 10 decomposes variation in test scores among students used in this study, to variation occurring within schools (Level 1), to that occurring between schools (Level 2). The first row decomposes test score variation without taking into account any characteristics of the students or the schools they attend. The first thing to note in this row 1 is that for both language and math scores, about 2/3 of test score variation across students occurs within schools (Level 1). On the face of it, this finding suggests that at most only 1/3 of test score variation can be attributed to differences in the quality of the school attended versus differences in students beyond the schools they attend.

To further investigate this interpretation, row 2 in **Table 10** controls for all of the student and family level predictors discussed above (student and family background characteristics, see **Table 9** for the complete list). As shown, we find that differences between schools are now quite a bit smaller. In the case of language test scores, only 19 percent (1743/8962) of differences in student performance occurs across schools, once student characteristics are accounted for. In the case of math, only 24 percent remains (2015/8496). What is noteworthy in **Table 9** is that while student characteristics help to explain some of the difference in average performance across schools in Paraguay, they do not explain differences across students. That is, accounting for differences in student characteristics does not reduce variation in test scores across students in Paraguay. This is a very surprising result that we return to later.

The final row of **Table 10** shows how much of the variation in student performance is reduced once both student *and* school characteristics have been accounted for (see **Table 9** for the complete list of teacher and school characteristics). For language, but much less so for math scores, school characteristics prove to be important in explaining variation in test scores among 6th graders, after accounting for student characteristics. In the case of language scores, 34 percent of the variation in average test scores among schools ((1743-1142)/1743) can be accounted for by differences in school characteristics, whereas for math, only 12 percent of differences in school performance can be traced to differences in school and teacher characteristics. Thus, to the extent that language test scores differ by schools (once student characteristics have been accounted for), we can trace some share of these differences to characteristics of the schools. For math, we are not able to trace much of the difference between schools to measured school characteristics.

While some portion of variation in school scores can be attributed to school characteristics, it still remains true that most of the variation in test scores across Paraguay can be attributed to variation within schools; and almost all of this difference between

students we cannot account for in our model. Indeed, the model as a whole only explains 21 percent of variation in language test scores, and only 10 percent of variation in math test scores. In this sense, we conclude that the main factors explaining test score variation are not measured in this study, and to the extent they are measured, they appear to reflect characteristics of the students and not the schools. And as discussed below, the most important "school level" factors we are able to measure -- the school's location (urban versus rural) and whether it is a private or public school – are factors that likely reflect characteristics of the students and their families, more than the school itself. This finding that school resources are not associated with student outcomes is a finding consistent with other studies of Latin American countries (Woβmann 2005; Mizala and Romaguera 2002).

With this overall conclusion in mind, we now examine in greater detail the magnitude of the effect of specific variables that we are able to measure.

While examining the decomposition of variation provides us with overall information on the importance of school and individual background characteristics in explaining differences in SERCE test scores in Paraguay, it does not tell us how important are the separate variables used in the models. For this purpose, we turn to **Table 11** below, which presents the estimated coefficients from HLM associated with each variable. We present estimates for math and language, as well as the level of significance associated with each coefficient. A quick glance shows that for the most part, variables are not statistically significant. However, given the amount of multicolinearity in the data set, this is to be expected. For this reason, our discussion pays attention to both the magnitude of the coefficient as well as its level of statistical significance. As a point of comparison, in our data set the standard deviation among math scores is 93 points, and it is 96 points among language scores.

Table 11

Estimated Coefficents from HLM (weighted)

	Language	Math
Student		
Age		-.72***
Female	10.0**	-6.05
Repeat	-23.3***	-19.6***
No PreSch	-1.6	-6.89
Hrs Wk Wrk	-0.24	-0.06
Family		
Castellano	7.18	2.72
Live Both P	-2	1.23
Live No P	21.1*	20.28**
Potable Water	5.5	-8.96
LoMothEdu	-11.2**	-6.14
Hi Moth Edu	8.6	7.85
HH Size	-0.1	-0.11
Less 10 Books	-19.7***	-14.85***
Attend Mtg	2.5	0.96
Teacher		
Age	0.64	0.49
Yrs Teach	-0.01	-0.1
Formation	.24.2	-3.92
Lo Edu	-10.3	-8.19
High Edu	14.7	2.71
Female	17.1*	-2.9
Low Exp	4.5	-8
Prof Absence	-14.8	-10.1
School		
Length Sch Yr	0.1	0.08
Enrollment	-0.17	-0.01
Nutrition Prog	20.6**	2.95
Pub Urban	40.9***	26.41**
Pri Urban	69.2***	59.06***
Dir Hir	15.2	10.37
Dir Salary	-4.1	22.82

* significant at the 10 percent level
** significant at the 5 percent level
*** significant at the 1 percent level

- **Student and Family Characteristics:**

As expected, there is some association between a student's socioeconomic background and test scores, although it is not as strong as expected. Students who report living with neither parent (4 percent of the students) scored 20-21 points higher than those who report living with

one parent[9]. Students with highly educated mothers score about 14-20 points more than those whose mother reported a low educational attainment. Students who report that their household has less than 10 books also scored about 15-20 points less than all other students. Females scored on average 10 points above males on the language test, but 6 points lower on the math test. Finally, students who reported having repeated a grade scored 20-23 fewer points than did other students.

- **Teacher Characteristics:**

Teacher age and experience show virtually no association with either of the test scores. However, where teachers reported that they had participated in a teacher formation program, students scored 24 points lower on the language test, and 4 points lower on the math test. This is a curious finding that we return to below. In classes where teachers report high educational attainment, students scored an average 25 points higher on the language test and 11 points higher on the math test, compared with their counterparts in schools where teachers report having low educational attainment. Students in classes with a female teacher scored 17 points higher on the language test, although they scored 3 points lower on the math test. Scores are noticeable lower (10-15 points) where principles report that professor absence is a significant problem at the school.

- **School Characteristics:**

As mentioned briefly above, the most important school-level factors associated with students' test score is the school's location (urban versus private), and whether it is a private versus public school. All else the same, students in private urban schools scored an average 60-70 points higher on the SERCE tests, and those in public urban schools scored 26-41 points higher, than did their counterparts in rural schools. These variables are likely picking up characteristics of students and qualitative aspects of their schools that are not measured in this study. Unfortunately, we cannot say precisely what these factors are. As mentioned in a previous section, this result is at odds with SNEPE test results indicating little difference between students in private and public schools, or in urban versus rural areas (see **Graphs 6 and 7**). We also find that in schools that offer a nutrition program, students score noticeably higher (21 points on average) on the language test, although we are not able to find a similar

[9]This result is somewhat surprising, but could reflect the practice of sending more academically promising children to live where educational opportunities are better.

association with math test scores. In schools where directors have a say over hiring decisions, students score 10-15 points higher.

In sum, we find that measures of student's socioeconomic background have some association with students' test scores but less than expected. Students with poorly educated parents (1/3 of students), few books in the house (2/3 of students), and who attend rural public schools (about ½ of students) score considerably below other students in Paraguay. Students with all three of these factors score on average around a standard deviation below students without any of these three factors (the standard deviation for math is 93 points, and for language it is 96 points). In addition, we find another important predictor of low test scores is when students report repeating a grade (which about ¼ of students in our data set do).

In terms of the association between teacher and school characteristics and test scores, we find a few interesting results. First is the curious finding that teacher formation appears to be negatively associated with test scores: in classrooms where the 5 percent of teachers who report not having pursued a formal formation are found, students' test scores are noticeably higher. We also find that student performance is lower where teachers have less formal education, and where professor absence is more common. Nutrition programs in schools are also associated with higher language scores. Finally, we find some preliminary evidence that test scores are higher where principals have greater autonomy in hiring and salary decisions.

Before concluding, it is worthwhile comparing these results with a similar analysis we undertook of student performance based on 6th grade 2004 SNEPE's results in mathematics and communication. We will not repeat our results here[10], but rather will briefly discuss the main similarities and differences.

1. In our analysis of SNEPE data, the low level of students' performance raised questions about the usefulness of this test for evaluating the factors associated with higher test scores. For example, models almost identical to those used here (with similar rich arrays of variables) were only able to account for about 15 percent of variation in math and reading test scores. We concluded that the SNEPE tests were likely too difficult for the majority of students, and thus were poor tools for evaluating the factors associated with educational quality. The fact that the SERCE and SNEPE provide very different information on the extent to which performance in private v. public schools, or among rural v. urban students, differs, underscores this concern. Yet this conclusion may well be relevant with SERCE data, too: average SERCE test scores in Paraguay are almost ½ a

[10]For complete results and discussion, see Instituto Desarrollo (2007).

standard deviation below regional averages. Given the large percentage of students who according to the SERCE are performing significantly below standards in reading and math, one must question the usefulness for evaluative purposes of the information contained in their test scores. It should also be noted that 4 percent of Paraguay's 6th graders fail to attain even the most basic Level I category on SERCE tests, a rate that is 2 to 4 times above the average among all SERCE test takers. Moreover, given poor reading ability among students, one must also question the validity of math test scores which in some cases may be capturing reading capacity rather than math reasoning skills.

2. To the extent we were able to identify the importance of school-level factors with the SNEPE associated with student performance, the main one was the frequency of teacher absence and cancelled classes due to teacher absence. While results from SERCE data are not as strong, we too find some evidence that student performance is lower where professors are more often absent.
3. Our analysis of SNEPE data concluded that students in private schools, all else the same, did not outperform students in public schools. Nor did urban students outperform rural students. This is distinct from what we found in the present study, where students in urban private schools significantly outperformed students in public schools and in rural areas. We believe this seriously calls into question the usefulness of SNEPE for evaluative purposes.
4. SNEPE data indicated that students with indicators of low socioeconomic status did not score much below other students in Paraguay. However students who reported working for money scored noticeably below other students. This lack of association between measures of SES and test scores is to a large extent similar to what we found in this analysis of SERCE test results.

6. Summary and Conclusions

This study has described Paraguay's educational system, and the changes that have occurred over the last couple of decades. During this time, Paraguay has witnessed an impressive increase in educational access and attainment. Yet attainment and the quality of educational outcomes still remain very low. One the other hand, the low performance of Paraguay's students is in line with performance and attainment in other Latin American countries with

similar income, comparing quite unfavorably with Paraguay's neighboring countries of Chile, Argentina, Uruguay and Brazil.

To investigate the factors associated with educational quality, this study has investigated the extent to which measured differences in student and school characteristics in Paraguay can explain differences across Paraguay in mathematics and language skills among 6th graders. The rich array of data, as well as the use of hierarchical modeling techniques has helped to reduce problems of self selection in the data. However without longitudinal data, we cannot eliminate this problem. We do, however, reach some tentative conclusions.

For one, we find that most of the variation in SERCE test scores occurs at the individual rather than the school level, a pattern also found in SNEPE data. We thus conclude explaining existing test score variation within Paraguay, would require a look beyond Paraguay's schools to explain why performance for students attending the same school is so variable. One conclusion from this variation among students, then, might be that explaining low performance must begin with examining the conditions in the home, family, and other aspects of the environment in which children are raised. However, based on both SERCE data and SNEPE data, we find that the measured characteristics of families and students explain only a small fraction of the differences in performance among students in the same school. For the most part, then, we conclude that individuals and families matter for educational outcomes, but we cannot conclude why and exactly how. To this end we conclude that Paraguay would benefit from a rigorous longitudinal study of student performance over time.

This overall conclusion about the inability of test score data to provide a compelling story explaining differences in the quality of education received by different students was one we also reached based on SNEPE test results. We believe that overall, this points to the very low ability level of Paraguay's students, such that tests designed for 6th graders are not well designed for Paraguay's 6th graders. This leads us to conclude that one possible problem in Paraguay's educational system is the curriculum and the progression of curriculum in its schools. If the SNEPE is designed to test the material taught up to the third and sixth grade, then either the curriculum in practice is not aligned with the test, or the expectations in the curriculum are not aligned with the ability level of the students. Either reason indicates that one problem may be with Paraguay's curriculum.

Indeed, the data also suggest why a logical and systematic progression of material in Paraguay's schools may be hard to implement in practice: not only is student performance low, but within schools it is very variable. This suggests that teachers may be faced with a

very challenging task of teaching children of (in some cases) very different ages, and very different ability levels. Both SNEPE and SERCE data indicate that many sixth grade students have difficulty reading, and too many students have repeated several grades.

We also reach some conclusions regarding teachers and the institutions surrounding teachers. We find evidence that student performance is higher with more educated teachers. The clear implication is that Paraguay needs to work to attain more educated teachers. While experience is rewarded in terms of salary, more experienced teachers do not appear to be better teachers. The evidence also calls into question the usefulness of teacher training. Evidence from the SNEPE indicated that teacher absenteeism was significantly related to student performance; we find some support for this here, and suggest that efforts are made to improve teacher attendance, especially given the high rate at which this was reported to be a problem (**Table 9**).

Finally, there is some evidence that test scores are higher where nutrition programs are in place, and where principals (directors) have greater autonomy. There may be potential in such policies, and we recommend that these programs be investigated more closely.

Thus, to conclude, we arrive at five recommendations:

1. Paraguay's Ministry of Education and Culture (MEC) should fund a careful longitudinal study of student performance, which collected detailed information on parents, students and school characteristics, and students' performance over time. It might also consider randomized studies to measure the impact of nutrition programs and principal autonomy.
2. MEC should reevaluate the use of the SNEPE as an evaluative tool. More useful might be short and frequent tests, particularly in the earliest grades, so that student progress can be closely monitored.
3. MEC should examine the content and progression of curriculum for its appropriateness, consistency, and logical progression.
4. MEC should address the effect on educational outcomes of having so many underperforming students in classrooms. At the least, MEC should prioritize teacher training in methods and strategies that account for a wide range of abilities in the classrooms, and in strategies to improve the performance of the lowest-performing students in the earliest grades.
5. Finally, MEC needs to reevaluate the training and hiring practices of Paraguay's teachers.

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