Report No.

Achieving World Class Education in Brazil:

The Next Agenda

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US$1	=	BRL$1.78

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ABBREVIATIONS AND ACRONYMS

ACS	American Community Survey
AVDI	*Asignación Variable por Desempeño Individual* Individual Teacher Performance Incentive (Chile)
BDE	*Bonus de Desempenho Educacional (Pernambuco state)* School Performance Bonus
CCT	Conditional Cash Transfer
CEFET	*Centro Federal de Educação Tecnológica* Federal Center for Technological Education
CENPEC	*Centro de Estudos em Pesquisa, Educação e Ação Comunitária* Center for Research on Education, Culture and Community Action
CGU	*Controladoria Geral da União* Brazilian Office of the Comptroller General
ECD	Early Childhood Development
ECERS	Early Childhood Environment Rating Scale
EDURURAL	*Programa de Apoio a Educação Rural do Nordeste do Brasil* Northeast Brazil Rural Education Project (World Bank)
ENADE	*Exame Nacional de Desempenho de Estudantes* National Exam for the Assessment of Student Performance
ENEM	*Exame Nacional do Ensino Médio* National Secondary Education Exit Exam
EPI	*Escola Pública Integrada* Integrated Public School
FUNDEB	*Fundo de Manutenção e Desenvolvimento da Educação Básica e de Valorização dos Profissionais da Educação* Fund for the Development of Primary Education and Appreciation of Teachers
FUNDEF	*Fundo de Desenvolvimento do Ensino Fundamental e de Valorização do Magistério* Fund for the Development of Basic Education and Appreciation of Teachers
FUNDESCOLA	*Fundo de Fortalecimento da Escola* Fund for School Strengthening and Development
GDP	Gross Domestic Product
ICE	*Instituto de Co-responsabilidade pela Educação* Institute for Co-Responsibility for Education

ICT	Information and Communication Technology
IDB	Inter-American Development Bank
IDEB	*Índice de Desenvolvimento da Educação Básica* Index of Basic Education Development
IDEPE	*Índice de Desenvolvimento da Educação de Pernambuco* Index of Basic Education Development in Pernambuco
IETS	*Instituto de Estudos do Trabalho e Sociedade* Institute of Work and Society
IIIE	International Institute for Impact Evaluation
INEP	*Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira* Anisio Teixeira National Institute for Education Studies and Research
ITERS	Infant/Toddler Environment Rating Scale
LAC	Latin America and the Caribbean
LDB	*Lei e Diretrizes de Bases* Basic Education Law
MDS	*Ministério do Desenvolvimento Social e Combate à Fome* Ministry of Social Development and Fight Against Hunger
MEC	*Ministério da Educação* National Ministry of Education
MIC	Middle Income Country
NATA	*Núcleo Avançado em Tecnologia de Alimentos* Center for Advanced Food Technology
NBER	National Bureau for Economic Research
OECD	Organization for Economic Cooperation and Development
PAR	*Plano de Ações Articuladas* Joint Action Plan
PEP	*Programa do Ensino Profissionalizante de Minas Gerais* Minas Gerais State Vocational Education Program
PIM	*Programa da Primeira Infância Melhor do Rio Grande do Sul* Rio Grande do Sul State program for Better Early Childhood
PIRLS	Program on International Reading Literacy Study
PISA	Program for International Student Assessment
PNAD	*Pesquisa Nacional por Amostragem de Domicílios* Brazilian National Household Survey
PPP	Purchasing Power Parity
PROALFA	*Programa de Avaliação da Alfabetização* Minas Gerais State Assessment of Early Literacy
PROEB	*Programa de Avaliação da Educação Básica* Minas Gerais State Assessment of Basic Education
REDEFOR	*Rede São Paulo de Formação Docente* São Paulo State Teacher Training Network
RTT	Race to the Top
SAEB	*Sistema de Avaliação da Educação Básica* National System for Evaluation of the Basic Education
SEDUC	*Secretaria de Educação do Governo de Pernambuco* State Secretariat of Education of Pernambuco

SEE	*Secretaria de Estado de Educação* State Secretariat of Education
SENAC	*Serviço Nacional de Aprendizagem Comercial* National Service for Commercial Apprenticeship
SENAI	*Serviço Nacional de Aprendizagem Industrial* National Service for Industrial Apprenticeship
SENAR	*Serviço Nacional de Aprendizagem Rural* National Service for Agricultural Apprenticeship
SIEF	Spanish Impact Evaluation Fund of the World Bank
SME	*Secretaria Municipal de Educação* Municipal Secretariat of Education
STEM	Short Term Economic Monitor
TIMSS	Trends in International Mathematics and Science Study
UNICEF	United Nations Children's Fund

Vice President:	Pamela Cox
Country Director:	Makhtar Diop
Sector Manager:	Chingboon Lee
Sector Leader:	Michele Gragnolati
Task Team Leader:	Barbara Bruns
Task Team:	David Evans, Javier Luque, Erica Amorim, Debora Brakarz, Tassia Cruz, Madalena dos Santos, Luciana Harrington, Martin Moreno, Vitor Pereira
Task Assistant:	Marize Santos

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Executive Summary

The 2009 results for PISA, the OECD's test of high school student learning levels in over 70 countries, confirm Brazil's impressive progress in raising education performance over the past decade. Brazil's 52 point increase in math since 2000 implies that students have gained a full academic year of math mastery over the decade, and Brazil's overall score increase – from 368 to 401 – is the third largest on record. Brazil's 2009 scores still trail the OECD country average and East Asian countries and are no grounds for complacency. But few countries have made faster or more sustained progress.

How did Brazil move from one of the worst-performing education systems of any middle-income country to one of strong and sustained improvement, not only in learning but also in primary and secondary school coverage? This is one of the central questions addressed in this report. By benchmarking Brazil's current education performance and identifying key issues, the book is intended as a resource for the new federal government in setting education priorities for the next four years. But it also tells the story of Brazil's remarkable run of policy continuity and sustained reform in education over the past 15 years. A six-year-old Brazilian child born today into the bottom quintile of the income distribution will complete more than twice as many years of schooling as her parents. The average educational attainment of the labor force since 1995 has improved faster than any other developing country, including China, which had set the global record for schooling expansion in the prior decades. Major gaps in performance with middle-income countries in LAC and elsewhere are closing, such as in primary school completion and pre-school coverage. And in key areas such as assessing student learning and education performance monitoring more generally, Brazil today is a global leader.

The "managed revolution" of Brazilian Education. Chapter 1 chronicles the transformation of Brazilian education that began when the Cardoso government in 1995 assumed three critical normative functions at the federal level that had previously gone unfilled. These were: i) equalizing funding across regions, states and municipalities with the FUNDEF reform; ii) measuring the learning of all children on a common national yardstick (SAEB); and iii) protecting the educational opportunity of students from poor families (Bolsa Escola). With those reforms, plus the first comprehensive legal framework for basic education (the Lei e Diretrizes de Bases in 1996) and the first national curriculum guidelines, the Ministry of Education got the core elements of a national education policy profoundly right.

But what happened next was equally important. The Lula administration elected in 2002 not only retained these core policies, but expanded and strengthened them. FUNDEF financing equalization was extended to secondary school and pre-school and called FUNDEB. Bolsa Escola was consolidated with other transfer programs into Bolsa Familia and coverage grew from 4.9 million families in 2002 to 12 million in 2009, with transfers increasing from 3.4 to 11.9 billion reais (in 2009 prices). The testing of a small national sample of students under

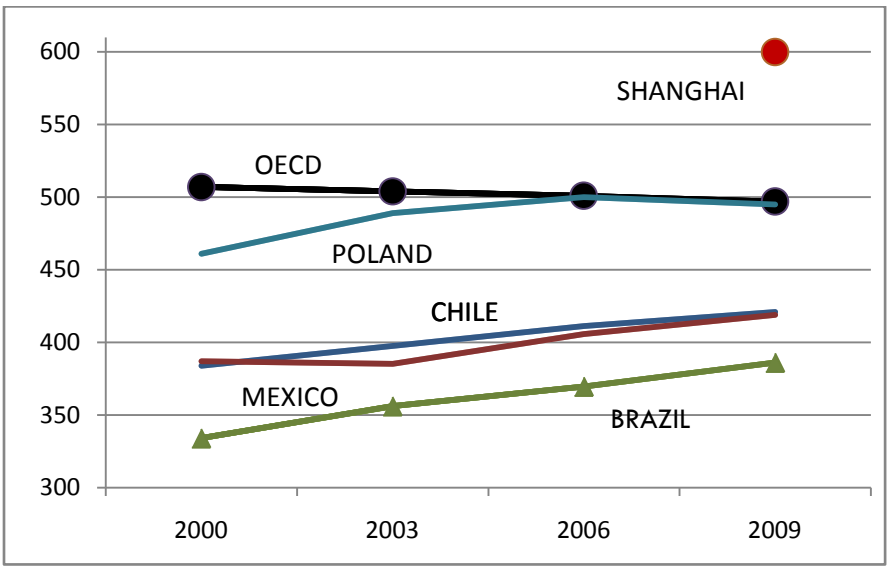
SAEB every two years was extended to a nation-wide test of math and portuguese called Prova Brasil and applied to all 4th, 8th and 11th grade students. Combined with data on student enrollment, repetition and graduation rates, a comprehensive index of school performance was generated, called IDEB (Indice de Desenvolvimento da Educacao Basica). With an IDEB score for all but the smallest of Brazil's 175,000 primary and secondary schools, 5,000-plus municipal school systems, 26 state systems and the federal district systems, every single segment of the Brazilian education system can benchmark how well its students are learning and how efficiently its school or school system is performing. No other large federal country in the world has achieved this.

Federal, state and municipal-level policies in education have been progressive and innovative in other areas, as well. The Ministry of Education's strong normative role has included new standards for teachers, federally-supported, higher quality teacher training programs, textbook screening and production. Investment support includes programs such as Mais Educacao, and expansion of the federal technical schools. The federal government has also strongly supported innovation – whether school-level planning under FUNDESCOLA, multi-grade teaching under *Escola Ativa*, or capacity building for municipal education managers, with PAR. An equally large wave of innovative reforms have taken hold at the state and municipal levels -- which have core responsibility for the delivery of pre-primary, primary and secondary education in Brazil.

Brazilian education in a competitive world. Chapter 2 examines how Brazilian education today stacks up against other countries in the OECD, LAC, and Asia. While Brazil is moving up, the rest of the world is not standing still. The chapter reviews the performance of the education system on three paramount functions: i) developing the labor force skills for sustained economic growth; ii) contributing to poverty and inequality reduction by providing educational opportunity to all; and iii) transforming education spending into education results – above all, student learning. It concludes that while progress has been substantial, the agenda ahead is crucial.

Labor force skills are improving, but still lag behind. Brazil is still quite far from the average learning levels, secondary education completion rates, and student flow efficiency of OECD and other middle-income countries. While Brazil had the strongest math improvement and 3rd largest overall improvement (behind Luxembourg and Chile) between 2000 and 2009 on PISA, it is still not the leader in the LAC region. Chile, Uruguay and Mexico all perform better in absolute terms. And while LAC countries as a group substantially trail the OECD average performance, the first-time entry of another BRIC into PISA (Shanghai, China) set an even higher benchmark. The gap in math skills between the average student in Shanghai and the average Brazilian student is approximately 5 school years. The implications are serious, as researchers over the past decade have generated compelling evidence that what students actually learn – measured on globally benchmarked tests such as PISA -- and not how many years of schooling they complete, is what counts for economic growth. (Hanushek and Woessman, 2009, 2010)

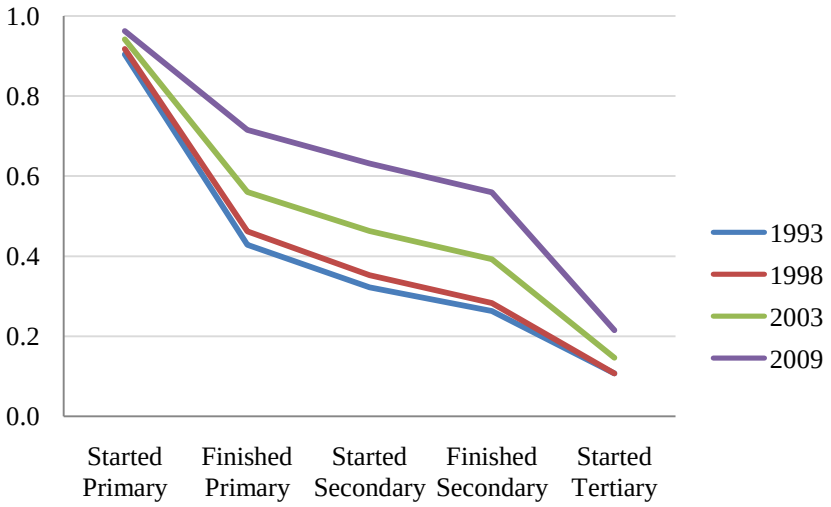
PISA Math Performance for Brazil and Selected Countries, 2000-2009



Source: OECD, 2010

The massive expansion of schooling in Brazil over the past 15 years has had dramatic effects on the labor force. In 1993, close to 70 percent of the labor force had not completed secondary school. Today that number is 40 percent. The biggest change is not access to primary school, but the much higher share of children who stay in school through secondary education. The rise in the share of workers with secondary education has been accompanied by a decline in the real wage for secondary education graduates in recent years. At the same time, there has been an increase in the wage premium for higher education graduates, which is consistent with a global pattern of demand for workers with strong analytical skills. Labor market data in Brazil are signaling that "21st century skills" are important for the next generation of workers in Brazil, and producing these will be a critical challenge for the education system over the next decade: graduates with the ability to think analytically, ask critical questions, learn new skills, and operate with high level communications/interpersonal skills, including foreign language mastery and the ability to work effectively in teams. For the basic education system, the overriding implication is the urgency of raising student learning.

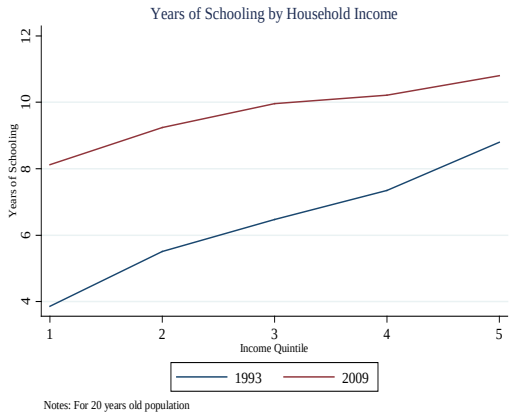
Change in Educational Attainment in Brazil, 1993-2009

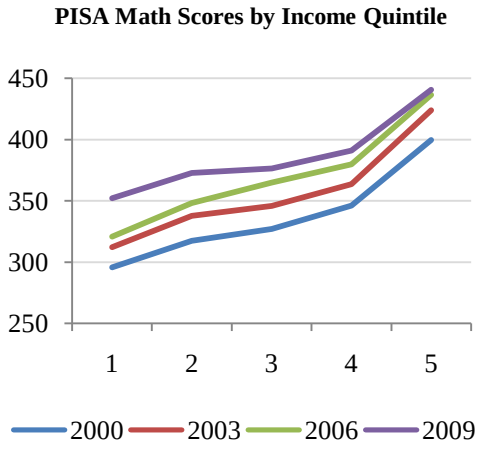


Source: PNAD, various years.

More equal education access is contributing to lower inequality and poverty, but gaps in learning achievement still remain. There has been a striking equalization in schooling attainment in just one generation in Brazil, as a result of aggressive expansion of schooling coverage and policies such as Bolsa familia. In 1993, the child of a father with no formal education would complete only 4 years of schooling, on average; today Brazilian students complete between 9 and 11 years of schooling, regardless of their parents' education. The Brazilian education advance has helped drive a significant improvement in income equality. Learning outcomes for students from the bottom income quintile have also improved, with especially rapid progress since 2006. But a gap still remains.

Average Schooling Completed and PISA Learning Outcomes, by Income Quintile



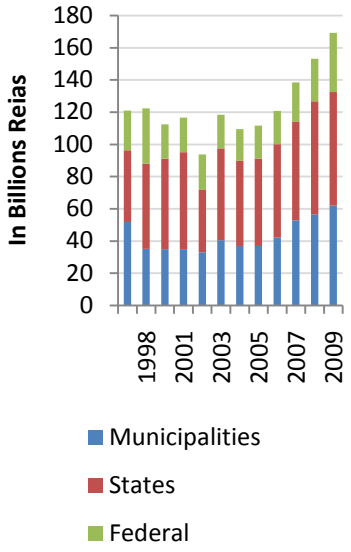


Sources: PNAD 1993 and 2009, PISA data 2000-2009

The issues underlying the low learning attainment of children from poor families become more complex over time. Physical access to schools and household budget constraints recede in importance, while social issues (teen pregnancy, gang and drug involvement), family instability (unemployment, domestic violence, homelessness), and learning issues and developmental deficits stemming from children's earliest years become more prominent. Since the core equity issue in Brazilian education has shifted from equalizing access to equalizing learning attainment, secretaries of education across Brazil are increasingly focused on two major strategies to address this, which are both consistent with global best practice: preventive interventions (expanding ECD services for low income families) and remedial interventions (tutoring, accelerated learning programs and other programs targeted to children with special needs.

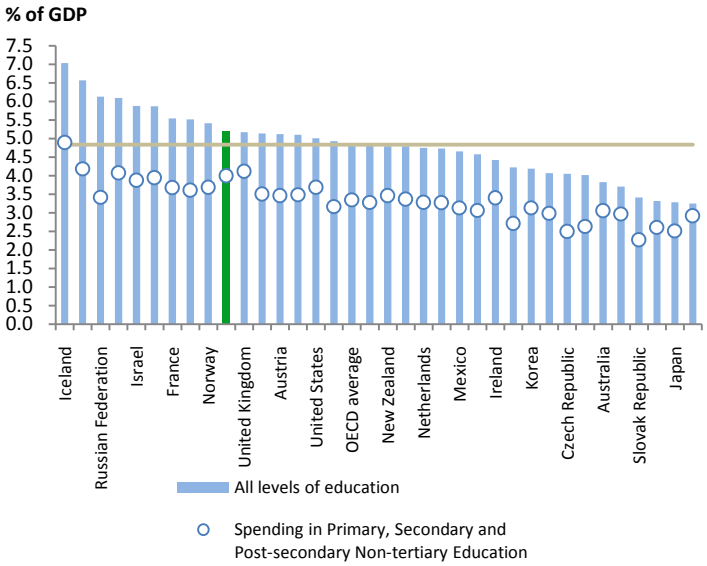
Education spending is outpacing results. The report raises concerns about Brazil's current level of spending on public education and, especially, about the government's proposed target of 7 percent of GDP for education. First, in 2007, public spending on education in Brazil (5.2 percent of GDP) was already above the OECD average of 4.8 percent of GDP. As the school-aged share of the population is larger in Brazil than in most OECD countries, this is to be expected. However, Brazil also spends more than Mexico, Child, India and Indonesia, which have similar demographic profiles. Second, Brazilian GDP is growing rapidly. But third and most importantly, Brazil is experiencing a demographic transition that will have a dramatic impact on the school-aged population over the next decade. The projected 23 percent drop in the number of primary school students will mean almost 7 million empty seats in schools across the country. Were Brazil to follow the Korean example and hold class size constant over this period, the primary school teaching force would decline by over 300,000 (from 1.3 million) by 2025. This transition is a bonus for the education system and would permit current spending levels to finance a large increase in schooling quality.

Consolidated Education Spending in Brazil, 2000-2009 (constant 2009 Reais)



Source: Brazilian National Treasury

Public education spending as a percent of GDP, OECD countries and Brazil (2007)

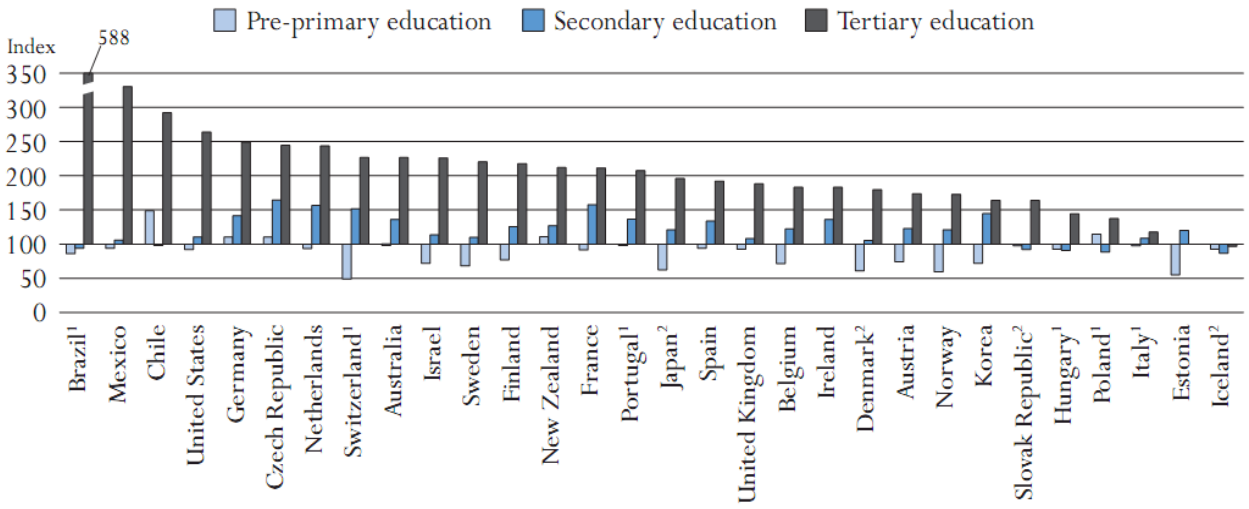


Source: OECD (2010). Education at a Glance. Table B2.4

In this context, the report suggests that the pursuit of spending increases should not detract attention from the areas where comparative data show that Brazil's current level of spending should be producing better results. One of these is the allocation of public funds across different levels of education: while OECD countries spend on average 2 times as much per student in tertiary education as at the primary level, Brazil spends almost 6 times as much. A second concern is persistent high repetition rates and high costs per graduate: Brazil retains one of the highest repetition rates in the world, despite substantial research evidence that repetition is an ineffective strategy for raising learning. A third issue is rising teacher costs: several policies over the past decade have lowered class size and imposed across-the-board increases in teacher salaries with little evidence – either in Brazil or elsewhere – that they contribute to improved results. Fourth, while the report lauds the quantity of innovative programs, privately-supported initiatives, and substantial investments in new technologies being undertaken in Brazil, it points to an almost complete lack of cost-effectiveness research to support policymakers' choices in these areas. Fifth, the report cites government audits and research studies which have documented a serious degree of corruption and mismanagement of education funds and evidence that these are highly correlated with poor education quality and results.

Spending per student at different education levels relative to unit costs in primary education (2007)

Primary education = 100



Source: OECD, 2010

Four key challenges for Brazilian education from 2010-2020. Grounded in this comparative assessment, Chapter 3 zeroes in on four critical challenges for the coming decade: raising teacher quality; protecting the early development of the most vulnerable children; building a world-class secondary education system; and maximizing the impact of federal policy on basic education – especially by capitalizing on the Brazilian "education action lab."

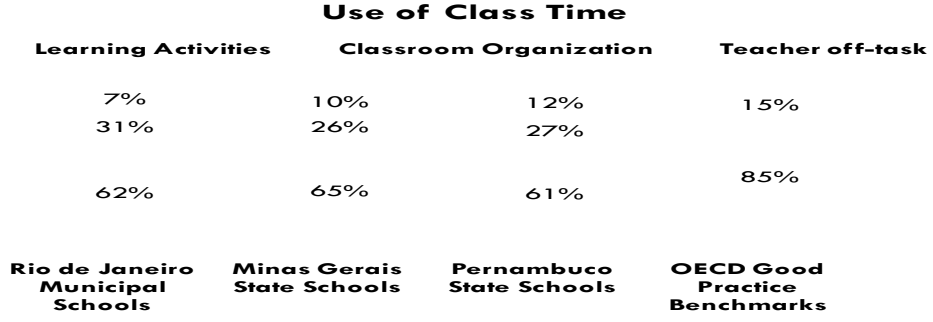
Raising teacher quality. In Brazil, teaching has become a low-status profession that does not attract high academic performers. Data show that teachers are recruited from the bottom third of

high-school students -- in contrast to Singapore, Korea and Finland, where they come from the top third. Raising teacher quality in Brazil will require recruiting higher-capacity individuals, supporting continuous improvement in practice, and rewarding performance.

Both the federal government and some state and local government have already begun reforms in these areas, such as with teacher bonus (pay for performance) programs in Minas Gerais, Pernambuco and São Paulo states and Rio de Janeiro municipality. With support from the Bank's education team, school systems are also using standardized classroom observation methods developed in OECD countries to look "inside the black box" of the classroom and identify examples of excellent teacher practice that can anchor their professional development programs. In Minas Gerais, Pernambuco, and Rio de Janeiro municipality, data showed that while the OECD benchmark is 85 percent of each instructional hour effectively spent on learning activities, none of the Brazilian systems studied exceeds 66 percent.

As detailed Chapter 3, Brazilian teachers spend substantial time on routine classroom processes such as taking attendance and collecting papers. A high share of teachers also fails to use available learning materials and between 43-64 percent of the time, students are visibly not engaged (in OECD countries, the benchmark for students "off task" is 6 percent of time or less.) Instead of theory-oriented courses, training programs designed from classroom observation evidence use videos and practical exercises to impart effective techniques for managing the classroom, using learning materials and keeping students engaged and on-task. This practice-oriented training is the new direction in OECD countries and key states and Rio de Janeiro municipality are getting ahead of the curve.

Use of Instructional Time in Brazil and OECD countries



Sources: Brazilian data collected by MG, PE and RJ education secretariats during 2008 and 2009; OECD data from Abadzi, H, 2009, "Instructional Time Loss in Developing Countries: Concepts, Measurement, and Implications," *World Bank Research Observer*, 24(2); e Stallings, J., 1985, "Instructional Time and Staff Development," in Fisher, C.W. e D.C. Berliner D.C., eds., Perspectives on Instructional Time.

Protecting early child development (ECD). Global research points to ECD interventions as the most powerful strategy for reducing inequality and leveling the education playing field. Over the past 15 years, Brazil has made progress in raising crèche enrollments from 8 to 18 percent of the

0-3 age group and pre-school enrollments from 49 to 81 percent. Priorities for the next decade are improving the targeting of services to the lowest income, most vulnerable children, and raising quality. The report recommends introducing curricula tailored to each educational level; more intense training and supervision of caretakers and educators; and strengthened monitoring and evaluation of ongoing programs. In each of these areas, there is a role for the Ministry of Education – in providing guiding materials and oversight – as well as the state or municipality – in implementing programs.

Building world class secondary education. No segment of the Brazilian education system crystallizes the quality gap with OECD and East Asian countries as clearly as secondary school. Fully 42 percent of secondary students are enrolled in night shifts, which deliver only 4 hours of instruction a day – compared with 7 hours or more in most OECD countries and even longer school days in leading East Asian countries. Infrastructure is deplorable – lacking the libraries, science labs, computer and language facilities most OECD students enjoy. The curriculum is overloaded and memorization-oriented, and virtually every state secondary school system faces severe shortages of qualified math and science teachers. As a result, 40 percent of all Brazilian secondary schools are considered "dropout factories" -- failing to graduate 60 percent of their students.

The challenges are extreme, but a number of states are already working on comprehensive strategies. Some, such as Minas Gerais, are developing important new approaches to a key issue for secondary education: the balance between academic and vocational content. Promising directions which can contribute to improvement in secondary education in Brazil can be loosely grouped as: system-wide strategies (curriculum and training reform, major infrastructure investments to support a longer school day and eliminate evening instruction, improving teacher quality); demonstration schools (full-day, highly resourced secondary schools that both test out innovations and demonstrate that high quality secondary schools are achievable); and public-private partnerships for technical and vocational education (to ensure a smooth transition to work for secondary education graduates who do not go on to higher education, by orienting the vocational content of the curriculum to skills that are in local demand and supporting more results-driven school management).

Maximizing federal impact and capitalizing on the Brazilian "education action lab." Given the progressive, effective education policies pursued by successive federal government administrations over the past 15 years, it is not trivial to identify policies that could substantially speed Brazil's progress toward world class basic education. But the analysis points to four recommendations for the next federal education minister:

- *stay the course on the core policies of the last15 years* -- FUNDEB funding equalization; IDEB results measurement; and Bolsa Familia conditional cash transfers

- *focus on spending efficiency rather than targets for higher spending*, which can worsen the risks of leakage and corruption in the system

- *create incentives for state-wide improvement* -- use more federal funding to reward states for closer integration of state and municipal school systems, and use less funding to "parachute" federal support directly to small municipal education systems

- *capitalize on the Brazilian "education action lab" by supporting systematic, rigorous impact evaluation* of innovative state and municipal programs.

Of these four recommendations, perhaps the last holds the most potential power. The long-term work of improving primary and secondary school performance is the responsibility of over 5,500 state, federal district, and municipal schools systems in Brazil. Literally thousands of creative new programs and policies are being tried out at this moment across Brazil by dynamic, results-oriented secretaries of education. Few other countries in the world have the scale, scope and creativity of policy action that can be seen today in Brazil. Even more unique is the large number of cutting-edge policy areas in which different states and municipalities are experimenting with similar programs with slightly different design features – such as the pay for performance programs in Minas Gerais, São Paulo, Pernambuco and Rio de Janeiro municipality, or the "accelerated learning" programs in these and other states and municipalities. The chance to study reforms and programs systematically makes Brazil one of the world's best laboratories for generating global evidence on "what works" in education. A concerted federal effort to mine this rich experience more effectively through rigorous impact evaluation might be the single fastest route to world class education.

Preface

Brazil has made great strides in education over the past 15 years and has set audacious national goals for attaining OECD-levels of quality by 2021. The country's rising political prominence and increasing economic integration arguably make faster progress in education more important than ever. In 1990, trade comprised only 15 percent of Brazilian GDP; from 2005- 2010, it averaged 20 percent[1]. Over the same period, the Brazilian education system expanded greatly, but while the share of young adults with a complete higher education averages 35 percent across the OECD, it is only 11 percent in Brazil -- a narrow strand of high level expertise to undergird the world's 8th largest economy.

This book aims to stimulate and support Brazil's national progress towards world-class education. It is focused on basic education, which in every country is the foundation for all other education progress.[2] It is divided into three sections. The first section puts the future challenges in perspective, by tracing Brazil's remarkable improvements in basic education over the past decade and a half. The second section benchmarks Brazil's current performance against other middle-income and OECD countries, with a focus on three critical functions: developing the labor force for a 21st century economy; contributing to poverty and inequality reduction; and efficiently transforming education spending into education results. The third section focuses on the most problematic areas of education performance today and reports on the latest research from Brazil and elsewhere that can support the design of sound reforms and cost-effective programs. This book will succeed if it persuades a broad audience of Brazilian policymakers and citizens that the country is making impressive progress in education, but the agenda ahead is crucial.

[1] World Bank 2010.

[2] Basic education in Brazil historically has consisted of a first cycle of 8 grades (called primary education in this report and known as "fundamental education" in Brazil) and a second cycle of 3 grades (secondary education). In 2006, the country adopted legislation extending the length of compulsory schooling by one year and creating a 9 year primary cycle. The official entry age to primary school was lowered from 7 to 6. The pre-school cycle was correspondingly shortened to cover aged 4-5, rather than 4-6. Since 2009 was the first year of implementation of the new reform, for consistency in comparing historical data, we use the old (4th grade, 8th grade, etc) rather than the new nomenclature (5th year, 9th year) throughout this report, unless otherwise specified. Higher education was a focus of two earlier World Bank publications, Knowledge and Innovation for Competitiveness in Brazil, 2008 and Higher Education in Brazil: Challenges and Options, 2002.

I. Brazilian education: 1995-2010 – Transformation

In 1994, a six year old Brazilian child born into the bottom quintile of the income distribution was likely to live in the rural Northeast, have a mother who had never entered a school, and complete no more than the first few grades of primary school herself -- even after spending multiple years attending, locked in a cycle of repetition. The local primary school was a one or two room structure without electricity or water and devoid of books or materials.[3] Its teachers were usually hired through political connections with the mayor. In 60% of cases, the teacher would not have completed secondary school; in 30% of cases, she would not have completed primary school. On unannounced visits, teachers and students might not be found in the school at all; when education researchers evaluating the World Bank-financed EDURURAL project in the late 1980s re-visited their sample of 600 primary schools across three Northeast states, over 30% had ceased to function.[4]

Schooling access and quality were less precarious in larger cities and richer parts of the country. But in 1990, on every education indicator imaginable Brazil lagged far behind middle-income Latin American countries and dramatically trailed the OECD. Less than 40% of children nationally completed the 8 grades of primary school, compared with 70% for the LAC region, and 95% for the OECD.[5] Only 38% of children enrolled in the three year (grades 9-11) cycle of secondary school, compared with over 70% in Argentina and Chile and 91% across the OECD. The average schooling level of the labor force in 1990 was 3.8 years – less than half that of Argentina, Chile, and the OECD. Less than 20% of primary teachers nationally had a higher education degree. The teacher wage in many rural areas was less than half the minimum wage. There were no national data on student learning.

Table 1: Average Educational Attainment of the Adult Population, Selected Countries 1960-2010

	1960	1990	2000	2010	Ratio 2010/1990	2010/1960
Argentina	5.3	7.9	8.6	9.3	1.2	1.7
Brazil	1.8	3.8	5.6	7.2	1.9	4.0
Chile	5.0	8.1	8.8	9.7	1.2	1.9
Colombia	2.8	5.5	6.5	7.3	1.3	2.6
Mexico	2.6	5.5	7.4	8.5	1.5	3.3
Peru	3.2	6.6	7.7	8.7	1.3	2.7
Canada	8.1	10.3	11.1	11.5	1.1	1.4
France	4.1	7.1	9.3	10.4	1.5	2.5
United Kingdom	6.0	7.9	8.5	9.3	1.2	1.5
USA	8.9	12.3	13.0	12.4	1.0	1.4
China	1.4	4.9	6.6	7.5	1.6	5.2
Japan	7.2	9.9	10.7	11.5	1.2	1.6
Korea, Rep.	3.2	8.9	10.6	11.6	1.3	3.6
OECD average	6.1	8.9	9.9	10.7	1.2	1.7

Source: Barro-Lee (2010)

[3] In 1992, the federal textbook agency FAE distributed 8.8 million textbooks, less than 10% of the estimated requirements of 100 million for over 30 million primary and secondary students.

[4] Harbison and Hanushek, Educational Performance of the Poor: Lessons from Rural Northeast Brazil, IBRD, 1992, p. 39.

[5] As noted in footnote 2, unless otherwise specified in this report we use the pre-2009 nomenclature (4th grade, 8th grade, etc) rather than the new nomenclature (5th year, 9th year), to facilitate the analysis of historical trends in data.

Fast forward to 2010. A six year old in the bottom quintile of the income distribution today will go on to complete more than twice as many years of schooling as her parents. No matter where in the country her school is located, per student spending will be protected at a level adequate for desks, electricity, water, books, pencils and workbooks. Her teacher will have at least a secondary school degree, and 60% of teachers nationally have higher education credentials. No matter where a school is located, its teachers will earn at least 1000 Rs per month, twice the minimum salary. Perhaps the most significant change of all, the school system at all levels knows how much that child is learning.

Table 2: Secondary Education Gross Enrollments, Selected Countries 1990-2008

	1990	2000	2008	Ratio 2008/1990
Argentina	71	86	85*	1.2
Brazil	38	104	101	2.6
Chile	73	83	91*	1.2
Colombia	50	69	91	1.8
Mexico	53	72	90	1.7
Peru	67	87	89	1.3
Canada	101	107	100**	1.0
France	98	110	113	1.1
United Kingdom	88	102	99	1.1
United States	92	94	94	1.0
China	49	63	76	1.6
Japan	97	102	101	1.0
Korea, Rep.	90	94	97	1.1
OECD average	91	108	105	1.1

* 2007, ** 2006
Source: Barro-Lee (2000 and updates), www.unesco.org

As the result of a remarkable 15-year run of policy continuity and sustained reform, the OECD's 2009 PISA test results confirmed that Brazil has made substantial progress in education. This report lays out the substantial agenda ahead, but there is no question that Brazil's efforts over the past 15 years are bearing fruit. From 1990-2010, Brazil increased educational attainment of the labor force faster than any other developing country, including China, which had set the global record for schooling expansion in the prior decades. (Table 1) Secondary school enrollments in Brazil have grown faster and are now higher than in any other LAC country, although part of this ratio reflects high repetition. (Table 2) Other major gaps in performance with middle-income countries in LAC and elsewhere are also closing, such as in primary school completion and pre-school coverage. In key areas such as assessing student learning and education performance monitoring more generally, Brazil in 2010 can be considered not only the leader in the LAC region, but also a model globally.

What has driven the Brazilian education advance? There have been many innovations in Brazilian education policy over the past 15 years at the federal, state and municipal levels and this report highlights a number of them. But the most important forces behind Brazil's progress are three critical areas where national policy has been on par with global best practice and implementation has been sustained and effective:

- Education finance equalization
- Results measurement

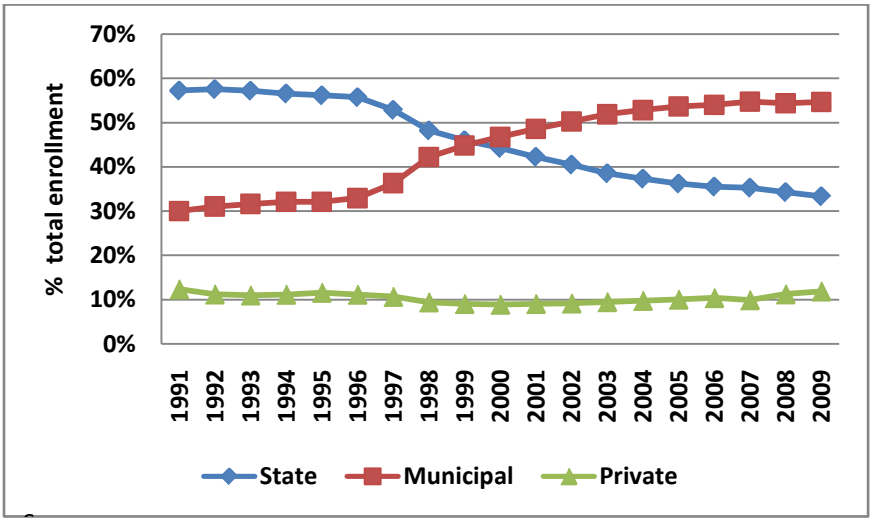
- Conditional cash transfers to increase schooling attainment of the poor

Education finance. The transformation of the federal government role in education finance in Brazil over the past 15 years is the revolutionary change that made all other progress possible. Prior to creation of the basic education equalization fund, FUNDEF (*Fundo de Desenvolvimento do Ensino Fundamental*) in 1996, wide disparities in spending per student existed across different regions in Brazil, and across different school providers within regions. While the 1988 Constitution had devolved responsibility for crèche and pre-school services to municipalities and secondary education to states, primary education was a divided responsibility between states and municipalities. The national landscape remained an administratively confused welter of state and municipal schools that were geographically proximate but had very different levels of per-student resources and quality. The Constitution required that 25% of all state and municipal-level taxes and transfers be spent on education, but the mandate did not take account of large variations in both schooling coverage and tax revenues across jurisdictions. As a result, while spending per primary student in municipal schools in parts of Northeast Brazil was less than Rs 100 per year – lower than in Nicaragua and Bolivia at that time -- it could be Rs 600 or more in state schools in the same region and Rs 1500 or more per year in state and municipal systems in the Southeast – or on par with schools in Korea and Singapore.

FUNDEF attacked these disparities through a three-fold strategy. First, it guaranteed a national minimum level of spending per student in primary education, which was set at Rs 315 in 1998, FUNDEF's first year of implementation. This represented a significant increase in resources for primary students in the Northeast, North and Center west states and particularly in municipally run schools. The guarantee capitation level meant that funding would "follow the student", which created a significant incentive for school systems – and especially under-resourced municipal systems -- to expand enrollments. There is evidence of municipalities instituting school bus systems, enrollment campaigns, school feeding and other inducements to get children into school for the first time after 1998. There was a significant increase in overall primary enrollments, with the net enrollment ratio in the Northeast and North climbing from 77 and 82 percent, respectively, to 94 percent by 2008, and there was a large overall shift in primary enrollments from state to municipal schools following FUNDEF. (Figure 1)

Funding could follow the student because of FUNDEF's second feature -- a federally mandated system of funding redistribution within states and a federally-managed top-up fund supplemented with federal resources. States were required to share resources across municipalities so that all state and municipal schools within the state could achieve the per-student spending threshold. The federal fund redistributed fiscal resources to states unable to achieve this through their own tax revenues. Overnight in 1998, FUNDEF redistributed Rs 30.6 billion (25 percent of total primary education spending) to 6 states. On average, FUNDEF tops up education resources annually for 6 of Brazil's 26 states (and federal district).

Figure 1: Primary Education Enrollments, by provider 1990-2009



Source: MEC/INEP

FUNDEF's third key feature was a mandate that 60% of the total per student allocation be spent on teacher salaries and 40% to other operating costs. States and municipalities were free to spend above the federally-established floor and many did. But the impact of the mandate in its first several years was a 70% increase in average teacher salaries in poorer municipalities in the Northeast and North.[6]

FUNDEF was designed with a sunset clause after 8 years and one of the most important examples of policy continuity between the Cardoso and Lula da Silva administrations was the reauthorization and expansion of FUNDEF in 2007 as FUNDEB – *Fundo de Manutenção e Desenvolvimento da Educação Básica e de Valorização dos Profissionais da Educação.* FUNDEB extended the equalization scheme to cover pre-primary education (both crèche services for children aged 0-3 and pre-school for children aged 4-6) and secondary education (grades 9-11). FUNDEB also explicitly guaranteed minimum levels of per capita funding for enrollments in education programs for indigenous and quilombo communities and youth and adult education (*Educação de Jovens e Adultos*). The minimum funding levels per student established by FUNDEB for the different levels of education are shown in Table 4.

Table 3: FUNDEB-Mandated 2010 Spending Levels (2010 Rs)

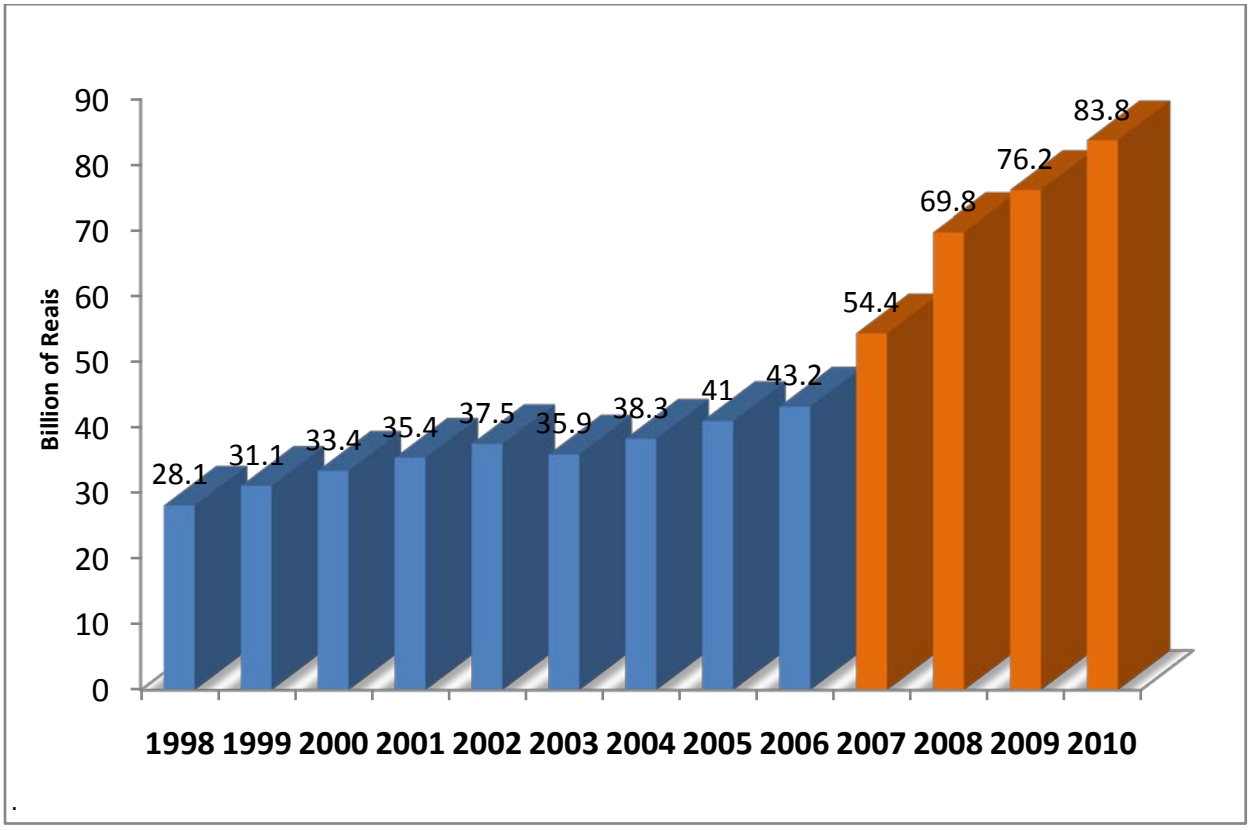
	Rs/student
ECD	
Crèches	1,558
Preschool	1,770
Primary education	1,416
Secondary education	1,840
Adult and Youth education	1,132
Source: MEC/INEP	

[6] Gordon, N. And E. Vegas, "Education Finance Equalization, Spending, Teacher Quality, and Student Outcomes: The Case of Brazil's FUNDEF" in Vegas et al. Incentives to Improve Teaching: Lessons from Latin America. (2005)

By raising minimum spending levels in basic education, FUNDEF and FUNDEB have driven a significant increase in overall education spending in Brazil since 1998, in real terms and as a share of GDP. From approximately 2% of GDP in 1995, basic education spending rose to 4% of GDP in 2008. If spending on higher education is added Brazil invested more than 5.2% of GDP in education in 2008, and this share continues to rise. In Chapter 2 of this report, we compare the level and allocation of Brazilian education spending with trends in other middle-income and OECD countries. The key message here is that the FUNDEF/FUNDEB reforms have transformed Brazilian education both by stimulating an overall increase in basic education spending after 1998 and by improving the equity of spending across regions and jurisdictions. (Figure 2)

Figure 2: FUNDEF/FUNDEB expenditures 1998-2010

(in billions of constant 2010 Reais)



Source: National Treasury, 2010.

Results measurement. From a starting point of *no* information on student learning in 1994, the Cardoso and Lula da Silva administrations have systematically constructed one of the world's most impressive systems for measuring education results. In many respects the Prova Brasil/Provinha Brasil student assessments and the IDEB (*Índice de Desenvolvimento da Educação Básica*) composite index of education quality system developed by the Ministry of Education's assessment arm INEP (*Instituto Nactional de Estudos e Pesquisas Educacionais*

Anísio Teixeira) is superior to current practice in the US and other OECD countries in the quantity, relevance and quality of the student and school performance information it provides. The *Prova Brasil* /*SAEB* test and IDEB rankings have become a high-visibility source of public information on school and system performance. Equally importantly, they are the measurement anchor for a new wave of policies in Brazil aimed at creating stronger incentives for teachers and schools. Box 1 describes the innovative character of the IDEB tool.

Brazil initiated a technically well-designed, sample-based student assessment system (SAEB) in 1995. SAEB conducted biannual tests of math and Portuguese to a nationally representative sample of students in the 4th and 8th grade of primary school and the 3rd year of secondary school. SAEB was designed to provide representative results at the state (but not municipal) level and to permit standardized tracking of learning progress over time. In 2000, Brazil joined the OECD's PISA (Program for International Student Assessment) and worked to ensure comparability between the national and international scoring scales. In 2005, the Ministry of Education expanded SAEB to cover ***all*** students in 4th and 8th grade in math and Portuguese every two years, and renamed the exam the *Prova Brazil*. (SAEB remains as a sample-based assessment at the 11th grade level.) The move to census-based application for primary education meant that for the first time data on the average learning performance in each school administered by Brazil's 5,564 municipalities (as well as the 26 states and the federal district) was available. In 2007, the Ministry added a voluntary test of 3rd grade reading literacy and numeracy, called the *Provinha Brasil.*

Chapter 2 looks in detail at what SAEB, *Prova Brasil* and PISA data reveal about the quality of Brazilian education today. Chapter 3 examines how test data are increasingly being used by education policymakers at all levels to track progress, create positive incentives, and target supplementary support for schools. The creation of the instruments and technical capacity for periodic, standardized measurement of student learning outcomes across almost 40 million students in 175,000 primary and secondary schools is a major achievement of Brazilian education officials over the past 15 years.

Reducing schooling costs for poor children. The third key education policy developed and sustained over the past two governments is a program of cash support to low income families to protect the schooling attainment of their children. The *bolsa escola*, a monthly payment to families in the lowest income quintile launched under the Cardoso administration in 2001 followed the conceptual foundation for other CCT (conditional cash transfer) programs in Latin America, such as Mexico's *Progresa/Oportunidades* program -- that public transfers to enable poor households to invest adequately in the schooling and health of their children are crucial for breaking the intergenerational transmission of poverty. By developing innovative distribution channels, such as ATM cards for low-income mothers who had never had a bank account before, *bolsa escola* broke new ground in terms of program administration and female empowerment.

Box 1: Targets That Avoid Perverse Incentives:

Brazil's Index of Basic Education Quality (IDEB)

The Brazilian Ministry of Education introduced in 2007 an innovative tool for systematic monitoring of basic education progress in every school, municipality, state (and federal district) and region of the country. The innovation lies in the IDEB index' combined measure of student learning results and student flows (grade progression, repetition, graduation, etc.). Because the index is the product of both test scores and pass rates, it discourages schools from automatic promotion of children who are not learning. However, it also discourages schools from holding children back in order to boost learning scores. Avoiding incentives for grade retention is important in Brazil, with average repetition rates in primary school approximately 20%, the highest in Latin America.

The IDEB builds on the progress Brazil has made in scaling up its national student assessment system to a technically well-regarded learning assessment that applied every two years to all 4^{th} and 8^{th} grade students in math and Portuguese -- called the *Prova Brasil*. The IDEB measure combines *Prova Brasil* test results with administrative data on school enrollments, repetition and grade promotion. The raw scale of the exams ranges from 0 to 500, and the standardized scale ranges between 0 and 10. Pass rates are calculated based on the information reported by each school to the National School Census, applied annually by the Ministry of Education.

The IDEB index for each grade-subject is calculated as the product of the standardized *Prova Brasil* score for the last grade in the cycle and the average pass rate for the cycle evaluated (π):

$$IDEB_{asj} = ProvaBrasil_{asj} * \pi_{asj}$$

where *a* is the subject evaluated (Portuguese or Mathematics); *s* is the cycle evaluated; and *j* is the school. The average pass rate in the cycle varies between 0 and 1 (it is 1 if the pass rate equals 100 percent). The standardized IDEB measure thus varies between 0 and 10.

The IDEB has become rapidly accepted in Brazil as the leading metric for gauging the relative performance of both individual schools and municipal and state systems. Biannual IDEB results are widely reported in the media and the federal government has established targets for improvement of primary and secondary education results for every one of Brazil's 26 state and federal district, and 5,564 municipal school systems. Within states and municipalities, IDEB reveals the relative performance of different schools. At the secondary school level, the index is based on SAEB test results (which is applied in a representative sample of schools in each state and the federal district) and student flow data. Thus, it generates state-level, but not school or municipal level scores.

Just one example of its impact is the way the IDEB has facilitated the implementation of teacher bonus programs at both the state and municipal levels over the past three years. Although the different state and municipal programs in operation have a number of alternative design features, all are based on annual targets for improvement in IDEB metrics. From the standpoint of federal education policy, this has created a powerful platform for comparative analysis of state (and federal district) and municipal innovations in basic education.

Source: Reynaldo Fernandes (2007), INEP (2008)

In 2003, the Lula da Silva administration renamed the program *Bolsa Família* and scaled it up further, by folding several other cash and in-kind transfer programs into a unified targeting system and streamlined administration. By 2009, *Bolsa Família* covered more than 12 million families across the country, or 97.3% of the target population.7 Unlike Mexico's *Progresa/Oportunidades* CCT, neither *Bolsa escola* nor *Bolsa Família* was phased in so as to permit a rigorous evaluation of the impacts, vis-a-vis a control group of families. A number of evaluations relying on less robust methods have found some evidence of positive impacts on a range of education outcomes, including enrollment, attendance, grade progression, retention rates, and even study time of students from beneficiary families.8

Table 4: Expansion of Bolsa Escola/Bolsa Família 2002-2009

	2002	2007	2009
Number of families benefitting	4.9 million[9]	11 million	12 million
Primary and secondary students benefitting	8.2 million	15.3 million	17.7 million
Amount transferred (in constant 2009 Rs)	3.4 billion	9.9 billion	11.9 billion

Source: SENARC, IBGE

Federal oversight. In general, the federal government after 1995 began to assume a stronger and more effective role in several areas that are key for management of a large and decentralized education system. In basic education, these include the normative functions of setting a basic legal framework for the sector (*Lei de Diretrizes e Bases*), national curriculum guidelines, developing nationally vetted lists of textbooks and reading books, supporting the development and delivery of teacher training and upgrading programs, and providing targeted technical and financial assistance to low-performing municipal education systems through the 2008 PAR initiative (*Plano de Ações Articuladas*). In 2009, the government also began implementing an increase in the length of compulsory primary education from 8 to 9 years. Under the reform, the two year pre-school cyle begins at age 4, the now nine year primary school cycle begins at age 6 (instead of age 7), and three years of secondary school begin at age 13. This makes the compulsory schooling cycle in Brazil one of the longest in the region. At the secondary level, the da Silva government has also invested substantially in expanding a network of high quality federal technical institutes (CEFET).

Although this report is focused on basic education, there have been advances in higher education policy as well. The ProUni program adopted in 2004 is a notable example. Designed to expand higher education access by subsidizing private university tuition for high-performing students from low income families, over 120,000 students per year have benefitted from ProUni since it was launched. Even though the higher education participation rate of low income students remains very low, ProUni is helping to move it in a positive direction. In other important areas, the da Silva government continued the innovative Cardoso initiatives to measure secondary school quality through a unified secondary school exit exam, ENEM, and to benchmark the

7 MDS em Números, www.mds.gov.br/gestaodainformacao/mdsemnumeros

8 For positive effects on attendance, retention, and study time, see de Oliveira A, "An Evaluation of the Bolsa Familia Program in Brazil: Expenditures, Education and Labor Outcomes," PAA 2009. For effects on attendance, grade progression, and retention, see Glewwe P and Kassouf AL, "The Impact of the Bolsa Escola/Familia Conditional Cash Transfer Program on Enrollment, Drop Out Rates and Grade Promotion in Brazil," Nov 2008.

9 An additional 1 million families with children aged –0-6 were subsidized under the Bolsa Alimentação Program.

relative quality of higher education programs through exit exams for key disciplines applied to university graduates across the country (*Provão*, now called *ENADE, Exame Nacional de Desempenho de Estudantes).* The da Silva administration also increased funding for scientific research allocated through a competitive peer review mechanism, and moved towards increased institutional autonomy and accountability for results in public universities.

Nonetheless, higher education policy is likely to be a key challenge for the next administration. By global standards, the share of youths enrolled in tertiary education remains extremely low and public spending per higher education student is exceedingly high. Over 80% of tertiary enrollments are in private institutions that are considered of low academic quality. The high quality of the best public universities – which are the leaders in the LAC region and outrank many European universities in publications and research citations – is a justifiable source of pride. But internal efficiency, whether measured as the number of students per teacher (which is about half of the OECD ratio) or the average years it takes an entering student to complete a four year program, is low.

Conclusion. The education landscape is changing in Brazil. Profound reforms of the basic education system over the past 15 years at the federal level have put in place the institutional framework for a higher-performing basic education system. An impressive number of governors and mayors have made education reform a political priority. Dynamic secretaries of education are moving ahead with creative programs and bold reforms that were unthinkable two decades ago. Education policymakers are beginning to support rigorous impact evaluations to establish which programs really work. Leading examples of promising reforms and the evidence on their impact are highlighted throughout this report. The next chapter assesses the performance of the Brazilian education system in a global context. Chapter 3 analyzes in greater depth the areas where further progress is most needed and reviews the research from Brazil and elsewhere on policies and programs that can spur improvement.

Box 2: Basic Numbers on Brazilian Basic Education, 2009

Level	Number of Schools	Number of Students	Number of Teachers	Years of Cycle	Starting Age
Primary (*Ensino Fundamental*)	**152,251**	**31.5 million**	**1,377,483**	**9**	**6**
➢ municipal	104,494	17.3 million			
➢ schools with less than 30 students	42,585	.7 million			
➢ private schools	20,297	3.7 million			
Secondary (*Ensino Médio*)	**25,923**	**8.3 million**	**461,542**	**3**	**14**
➢ federal technical schools	217	.09 million			
➢ private schools	7,415	.97 million			
Pre-primary (not including daycare) (*Pré-escola*)	**114,158**	**6.7 million**	**369,698**	**2**	**4**
➢ private	27,799	1.8 million			
Other (adult ed., etc.) (*Educação de Jovens e Adultos, Educação Especial*)		**5.7 million**			
TOTAL	**197,468**	**53.8 million**	**1,977,978**		

Sources: INEP, *Censo Escolar* 2009.

Notes: (1) The total number of school establishments is smaller than the number of primary and secondary "schools" because pre-schools, primary and secondary schools can share buildings. Similarly, the total number of teachers is smaller than the sum of teachers by level because some teachers work in multiple assignments. (2) The 2009 data reflect the new extension of the primary school cycle from 8 to 9 years of schooling, beginning at age 6. The implementation of this change beginning in 2009 creates a break in enrollment data both for pre-school (which previously covered ages 4-6 and now covers ages 3-5) and primary school, in comparison with enrollment data for prior years.

II. Brazilian Basic Education: 2010 – Meeting the challenge?

Education systems play a critical role in every country in empowering people to develop their full human capabilities, building national unity, transmitting national culture and stimulating social development. But from an economic standpoint, an education system is judged by how efficiently it performs three paramount functions: i) developing the labor force skills for sustained economic growth; ii) contributing to poverty and inequality reduction by providing educational opportunity to all; and iii) transforming education spending into education results -- above all, student learning. How does Brazilian education today compare to other countries in meeting these challenges?

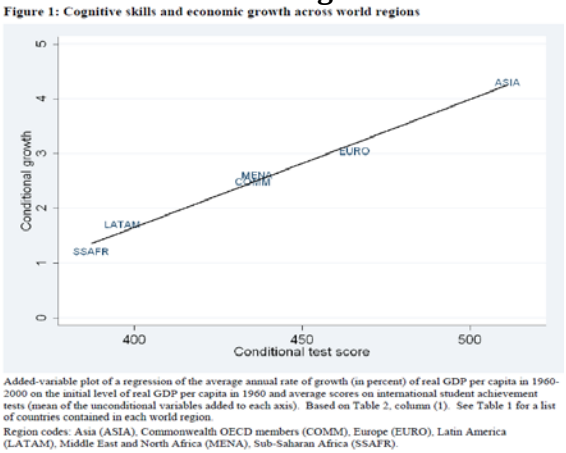
A. Meeting the needs of a 21st century economy.

Brazil's integration in the world economy is projected to increase significantly in the coming decade. With a trade to GDP ratio of 20 percent, Brazil remains one of the least open economies in the world. For comparison, among OECD countries only Japan and the US have lower traded shares in total output. Greater economic integration offers the promise of higher and more sustainable economic growth. But it also implies increasing pressure on the Brazilian labor force to reach globally competitive levels of productivity. While many factors affect labor productivity, export competitiveness and attractiveness to global investment, research has consistently pointed to human capital accumulation as a critical element. Traditionally, national "human capital" has been measured as the average years of schooling of the labor force, which – as we saw in Chapter 1 -- has grown faster in Brazil since 1990 than in any other major country.

Learning is what counts for growth. However, over the past decade education researchers have generated evidence that what students actually learn, and not how many years of schooling they complete, is what counts for economic growth. Moreover, the crucial yardstick is not learning measured by national standards, but in comparison with the best performing education systems globally. Analyzing data on student performance on internationally-benchmarked tests (such as PISA, TIMMS, and PIRLS) from more than 50 countries over a 40 year period, education researchers Hanushek and Woessman (2009, 2010) have demonstrated a tight correlation between average student learning levels and long-term economic growth. A country with average test performance one standard deviation higher than another's (approximately the difference between the average scores of Brazil and the United Kingdom or Norway on the 2009 PISA exam) will have enjoyed a 2 percentage point higher average annual growth rate of GDP over the 1960-2000 period.

As shown in Figures 3 and 4, the relationship holds across high-income countries, across low-income countries, across regions and across countries within regions: differences in average cognitive skills are consistently and highly correlated with long-term rates of per capita income growth. Moreover, while the *quantity of education* (average years of schooling of the labor force) is statistically significantly related to long-term economic growth in analyses that neglect education quality, the association between years of schooling and growth falls to close to zero once *education quality* (measured by average scores on internationally-benchmarked tests) is introduced. It is the quality of education that counts for economic benefits from schooling.

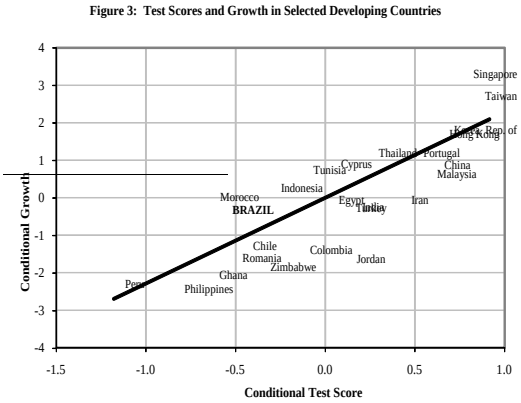
Figure 3: Cognitive skills and growth across regions



Added-variable plot of a regression of the average annual rate of growth (in percent) of real GDP per capita in 1960-2000 on the initial level of real GDP per capita in 1960 and average scores on international student achievement tests (mean of the unconditional variables added to each axis). Based on Table 2, column (1). See Table 1 for a list of countries contained in each world region.

Region codes: Asia (ASIA), Commonwealth OECD members (COMM), Europe (EURO), Latin America (LATAM), Middle East and North Africa (MENA), Sub-Saharan Africa (SSAFR).

Figure 4: Cognitive skills and growth across countries

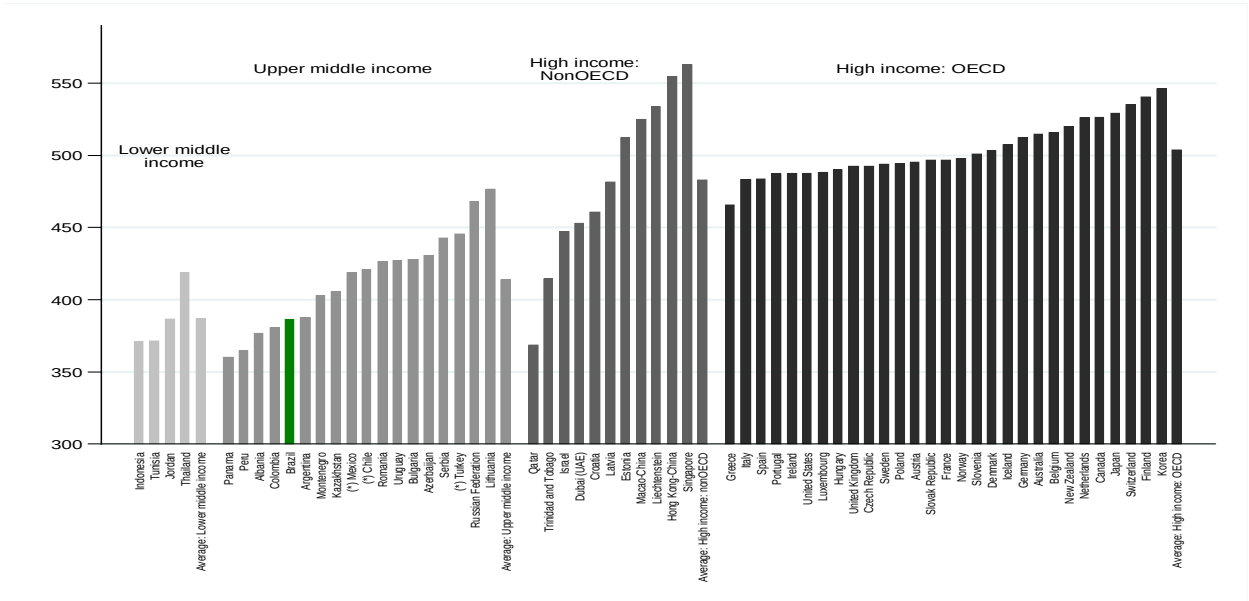


Source: Hanushek and Woessmann: Education Quality and Economic Growth (2007)

Source: Hanushek and Woessmann, Education Quality and Economic Growth, 2007

Brazil's consistent participation in the OECD's PISA since 2000 has generated excellent comparative data on how its average student learning stacks up. PISA 2009 results confirm the country's significant, sustained progress since 2000. In mathematics in 2000 Brazil ranked second to last among participating countries (only Peru was lower). By 2009, Brazil's 52 score point increase in math over the decade was one of the largest on record. Brazil's average score across the three disciplines tested (reading, math and science) rose 33 points over the decade, from 368 to 401. This represents the third largest improvement of any country over the period, after Luxembourg (38 point increase) and Chile (37 point increase).

Figure 5: PISA 2009 Math Scores, All Countries

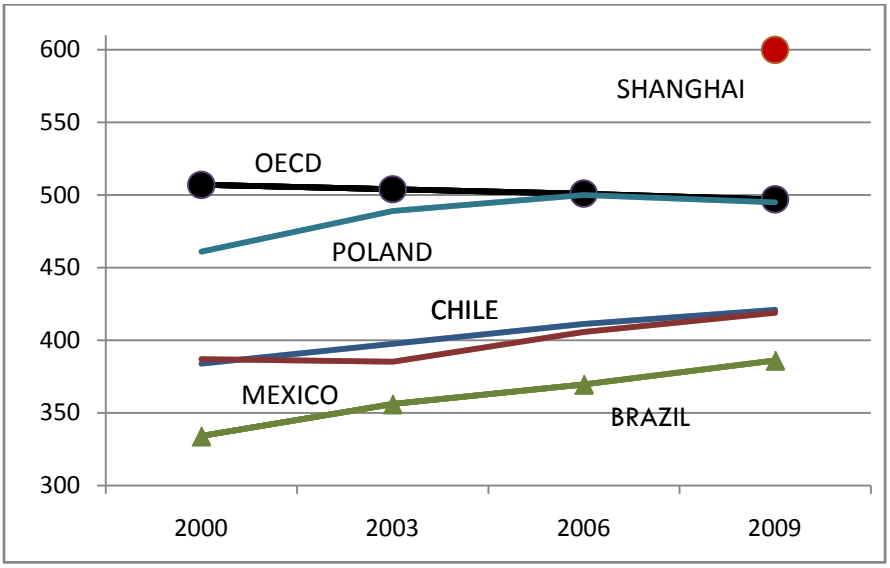


Source: OECD PISA 2009

Note: (*) indicates the country is classified as an Upper Middle Income Country but is also member of the OECD.

Brazilian skills are improving, but still lag behind. Despite the impressive progress, Brazil is still quite far from the average learning levels, secondary education completion rates, and student flow efficiency of OECD and other middle-income countries. As seen in Figure 5, Brazil's learning outcomes are still below the average for middle-income countries and even below some lower-income countries, such as Thailand and Jordan. Nor is Brazil a leader within Latin America: Chile, Uruguay and Mexico all perform better in absolute terms. And while LAC countries as a group substantially trail the OECD average performance, the first-time entry of another BRIC into PISA (Shanghai, China) set an even higher benchmark. The approximately 210 score point gap in math skills between the average student in Shanghai and the average Brazilian student is equivalent to approximately 5 school years.

Figure 6: Brazil – PISA Math Performance 2000-2009



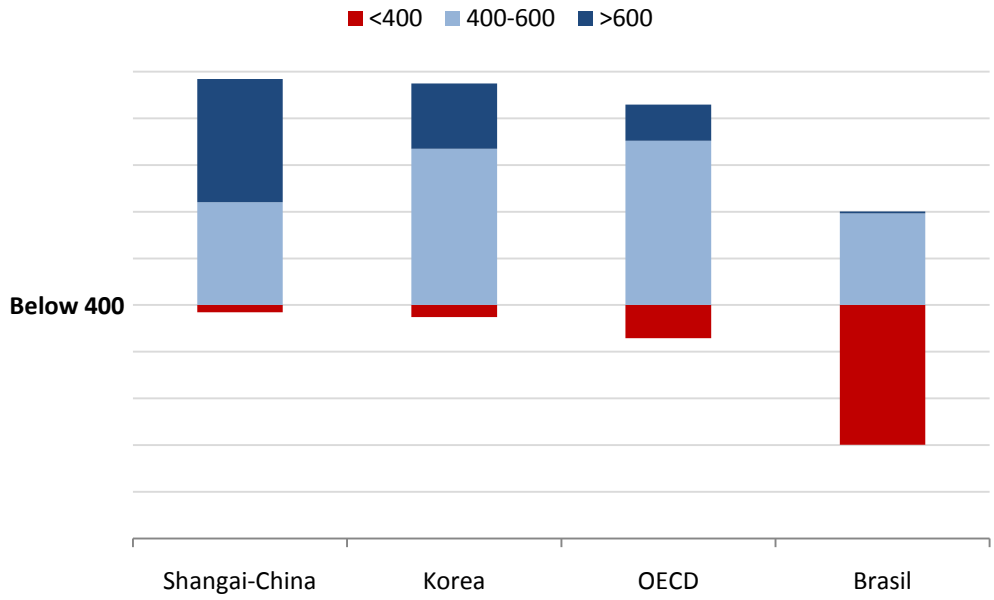
Source: OECD, 2010

Analysis also reveals that the main reason for Brazil's improvement has not been an increase in the average math proficiency levels of Brazilian 9th graders – which has stayed relatively flat -- but a reduction in age-grade distortion among the population of 15 year olds tested. Whereas in 2000, 43 percent of the Brazilian sample had not yet reached the expected (9th) grade, by 2009 this share had declined to 25 percent. This is an important improvement, as Brazil's extraordinarily high repetition rates and age-grade distortion are a serious efficiency issue that we discuss later. The point here is simply that the PISA results through 2009 do not show Brazilian 9th graders closing the gap with OECD learning levels; they mainly show more students getting to the appropriate grade on time.

The PISA test is constructed to measure trends in countries' average student scores over time, relative to the mean score of 500 achieved by the OECD countries as a group in the year 2000, and also to measure the percentage of students in each country scoring above a "high performance" threshold (proficiency level 5 or 6, roughly equivalent to a score of 600 or more)

and a "low performance" threshold of level 1 (roughly equivalent to a score of 400). Students scoring at this level or below are considered to lack even the most basic literacy and numeracy skills. Yet decomposition of Brazil's 2009 performance shows that -- despite Brazil's tremendous math progress -- ***fully 60 percent of students still scored below 400 – ie. lacking a minimum set of numeracy skills.*** Across the OECD, only 14 percent of students scored below 400, and in top performing Korea and Shanghai, only 5 and 3 percent of students, respectively, did. Comparing the distribution of students across these performance bands in 2009 gives a graphic sense of how badly Brazilian education lags competitor countries. (Fig. 7) Box 3 provides some examples of questions that students scoring below 400 cannot answer correctly.

Figure 7: Comparative PISA Math Proficiency, 2009
(Percent of Students Scoring at "High", "Average" and "Below Basic" Levels)



Source: PISA 2009 database

Notes: Bars are anchored to the "below 400" threshold. Percentages for the three groups add up to 100 percent. Thresholds map to PISA standardized scores. A score of 500 represents the mean score and 100 points is the score associated with 1 standard deviation.

While it is easy to see how a large share of students lacking basic skills might constrain labor productivity and economic growth, Hanushek and Woessman have also analyzed the importance of a critical mass of students at the high performance end of the spectrum – as they put it: "Is it a few rocket scientists at the very top who spur economic growth, or is it education for all that lays a broad base at the lower parts of the distribution?" When they separately analyze the cross-country learning data for the share of students above each threshold, both turn out to be separately significantly related to economic growth. Both the broad diffusion of basic literacy

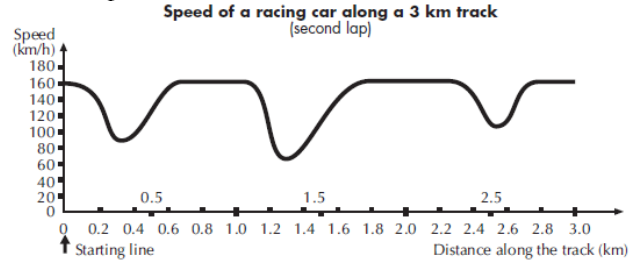
Box 3: "Basic Numeracy" as Measured on PISA

On the PISA 2006 test, students who could not answer math questions at the lowest level of difficulty (Level 1) scored between 357.8 and 420.1 (roughly 400, on average). Level 1 questions are presented in a familiar context, are clearly defined, and require very limited mathematics skills -- only the need to understand a simple text and to link the explicitly-presented information to a basic mathematical calculation.

The two questions below corresponded to Level 1. Across all OECD countries in 2006, **80%** of students answered these questions correctly. Only **11%** of Brazilian students could do so.

Question 1: Speed of Racing Car

This graph shows how the speed of a racing car varies along a flat 3 kilometre track during its second lap.



Where was the lowest speed recorded during the second lap?

A. at the starting line.
B. at about 0.8 km.
C. at about 1.3 km. (Correct Answer)
D. halfway around the track.

Question 2: Exchange Rate

Mei-Ling from Singapore was preparing to go to South Africa for 3 months as an exchange student. She needed to change some Singapore dollars (SGD) into South African rand (ZAR). Mei-Ling found out that the exchange rate between Singapore dollars and South African rand was: 1 SGD = 4.2 ZAR. Mei-Ling changed 3000 Singapore dollars into South African rand at this exchange rate. How much money in South African rand did Mei-Ling get?

Correct Answer: 12,600 ZAR

Sources: PISA 2006 - Science Competencies for Tomorrow's World, Vol. 1 (Ch. 6: A Profile of Student Performance in Reading and Mathematics from PISA 2000 to PISA 2006) and Take the Test: Sample Questions from OECD's PISA Assessments 2000-2006.

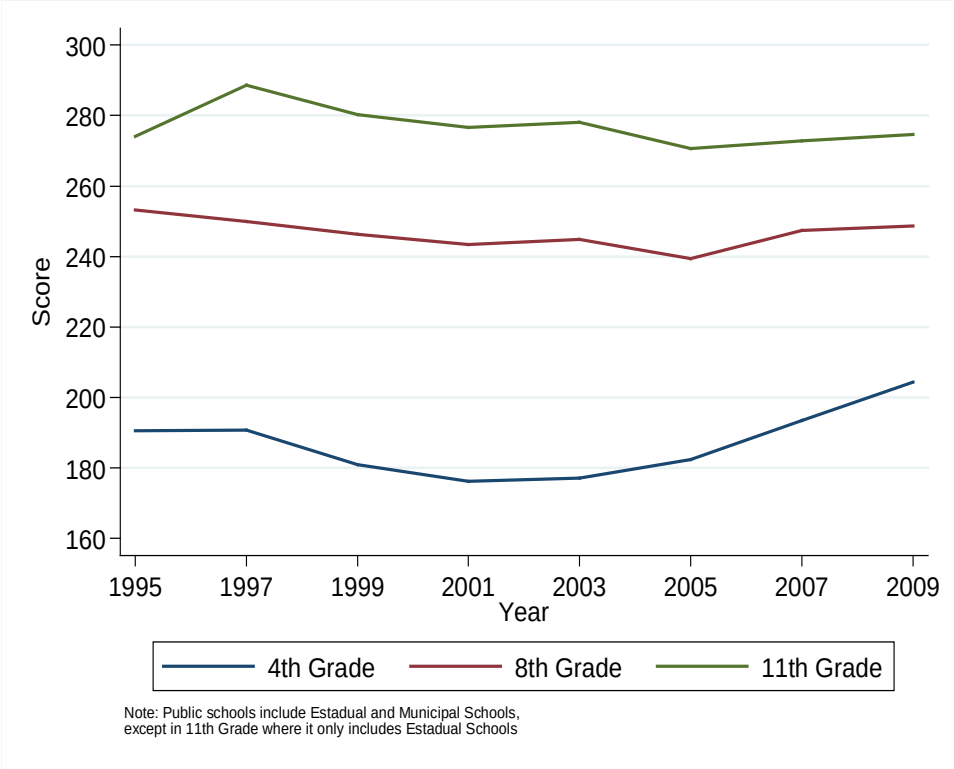
Contributed by Debora Brakarz.

skills across the population and the share of top performers seem to exert separately identifiable effects on economic growth. [10]

Here, Brazil's performance is equally troubling. Whereas 53 percent of 15 year olds in Shanghai, 28 percent in Korea, and 15 percent of students across all OECD countries have high level math skills (scoring over 600), only 1 percent of Brazilian students could perform at this level.

PISA only tests secondary school-aged (9th grade) students, but Brazil's excellent national testing system – SAEB and Prova Brasil – tracks learning levels of students in 4th, 8th and 11th grade. The newly introduced *Provinha Brasil* since 2007 also tracks learning of 3rd graders. Figure 8 shows the most important national trends. First, a clear decline in average learning levels from 1997-2000 is observed. This is expected, as the rapid expansion of schooling access, primary completion and secondary participation rates over this period drew a large number of poor and academically less prepared children into the school system. Second, considering this context, there was a modest but encouraging uptick in learning outcomes from 2001-2003, which was also reflected in PISA (when Brazil registered the strongest improvement in math performance in Latin America.) Third, progress clearly slowed after 2003, but it appears to have resumed since 2005. This upward trend was reflected in Brazil's 2009 PISA performance.

Figure 8: Brazilian Math Proficiency on SAEB/Prova Brasil, 1995-2009



Sources: SAEB (1995-2005), Prova Brasil/SAEB (2007-2009)

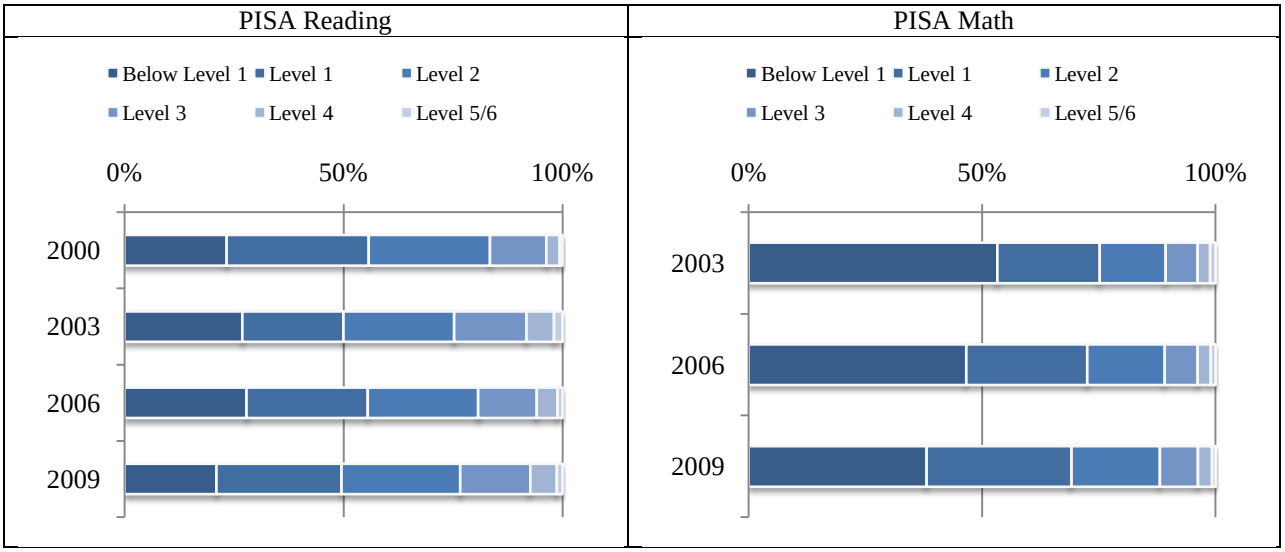
[10] Hanushek and Woessman, 2007

Following Hanushek and Woessman's evidence that the evolution of the top and bottom ends of the performance distribution were both important for long term growth, we decomposed Brazilian reading and math scores on PISA by performance band, to analyze these trends over time. They follow quite different patterns. Brazil's performance in reading shows no clear trend. The share of students at the very lowest levels of performance (Level 1 and below) showed no improvement from 2000 through 2006 before improving slightly in 2009. The share of students that lack basic literacy skills in 2009 remained at about what it was in 2003 – 50 percent of all test takers. This is not encouraging. At the high end of the scale, the share of students performing at Level 5 or 6 also fluctuated over the period, but in 2009 remained a tiny 1.3 percent of test takers. Equally troubling is the apparent lack of progress in bringing the lowest-performing students up to a basic level of literacy by global standards.

In math, there has been clear progress in raising the skills of the very lowest-performing students; the share of students scoring below Level 1 dropped from 53 percent in 2003 (the first year that comparable disaggregated data are available) to 38 percent in 2009 – a substantial move in the right direction. Considering, however, that Level 1 also represents inadequate mastery of basic math skills, the picture is not as encouraging. While the share of students performing at Level 1 and below is shrinking, it still remains high. It also appears that most of the improvement in Brazil's average math score over the decade has been driven by this progress at the low end. The share of students at the highest performance levels in math (Levels 5 and 6) made no progress over the period.

Viewed against the education performance of middle-income competitor countries, especially in East Asia but also in Latin America, it is hard to overstate the urgency of faster improvement in learning achievement at the "high end" in Brazil.

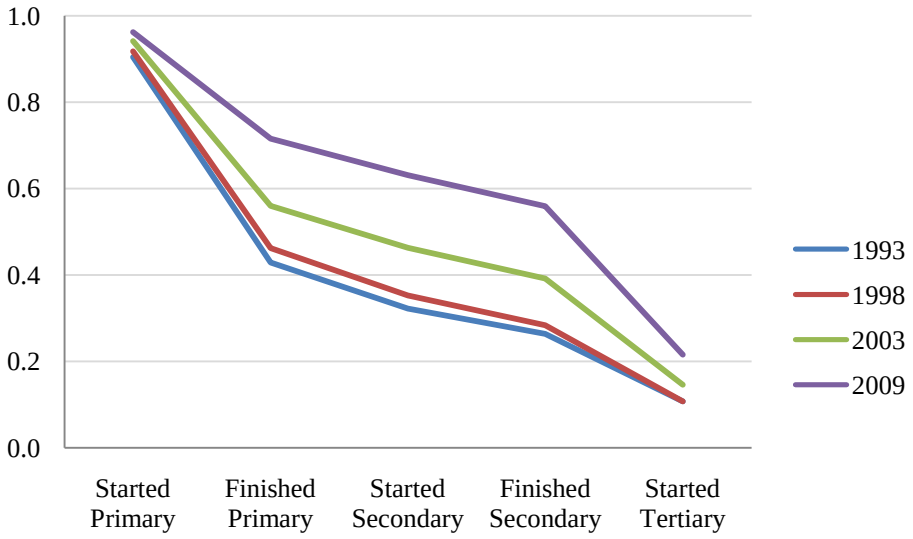
Figure 9: Share of Students by Proficiency Level, Reading and Math, PISA 2000-2009



Source: OECD PISA database, 2000-2009

Economic returns to skills in Brazil. The massive expansion of schooling in Brazil over the past 15 years has had dramatic effects on the education structure of the labor force. In 1993, close to 70 percent of the working population aged 26-30 had less than 11 years of schooling; today that number is 40 percent. Figure 10 shows how the educational attainment curve has shifted upward over the past 15 years. As can be seen, the biggest change is not in initial access to primary school; even in 1993 virtually all children started primary school. The change has been in the share of children who stay in school through secondary education. The share of children who complete primary education has increased from roughly 42 to 71%, and the share of children who complete secondary school has risen from 28% to 55%. Access to tertiary education remains relatively low.

Figure 10: Change in Educational Attainment in Brazil, 1993-2009



Source: PNAD, various years.

Table 6 presents data on changes in real wages by years of schooling over the period and Figure 11 presents these trends graphically. Given the huge increase in the share of workers with secondary education, it is perhaps not too surprising that the real wage for those workers fell over the period by almost 10%. It increased until 1998, declined sharply through 2003 and has rebounded somewhat, but still reflects no premium in the labor market for completing secondary school. While there has also been significant volatility in real wages for workers with tertiary education, the change over the period is positive, with an increase of 8.4%. Wages for primary school graduates have increased modestly. Finally, a very large increase in the real wage for workers with 4 years or less of schooling is observed.

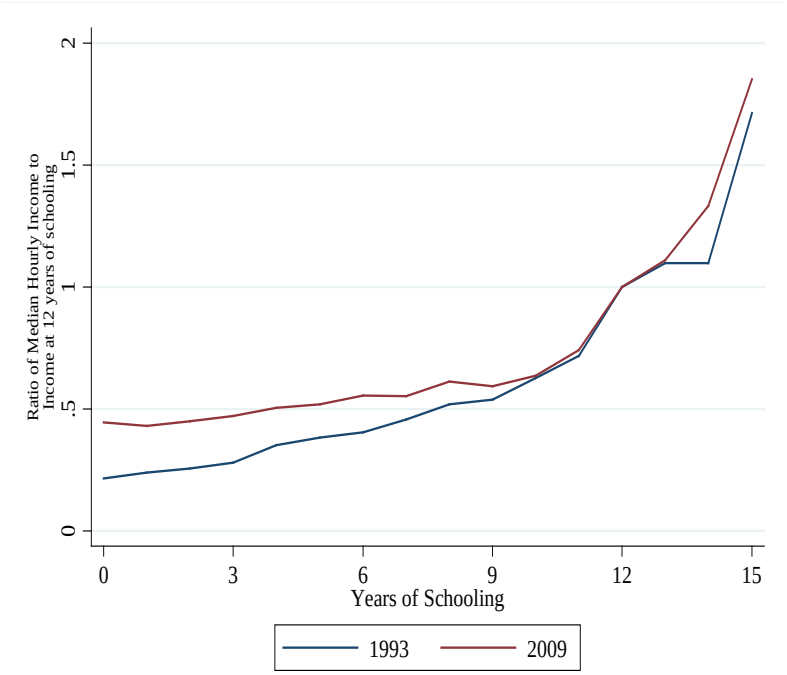
Table 5: Changes in Real Salary by Years of Schooling, 1993-2009

Schooling (grades) Completed	1993	1998	2003	2009	Change 1993-2009
4 years	444.9	517.8	411.4	512.9	15.3%
8 years	658.8	778.8	750.2	713.9	8.4%
11 years	925.9	1049.4	750.2	856.4	-7.5%
12 or more years	1590.2	2011.2	1590.1	1774.5	11.6%

Source: PNAD

What explains these somewhat unusual patterns? Several factors. The stagnation in the returns to secondary education over the period as a whole is consistent with the possibility that the huge increase in supply of these individuals outstripped the growth of labor market demand for this level of skills. The sharp decline in real salaries through 2003 is could also be explained by the SAEB evidence that average skill levels also declined over this period of massive expansion in secondary enrollments. The rise in real wages for secondary graduates from 2003-2009 could be consistent with Brazil's PISA results, which show improvement in average skill levels of secondary-level students, particularly in math. But how much of a role this supply-side explanation plays, relative to demand-side factors such as the growth of industries or occupations that require secondary graduates, is difficult to say.

Figure 11: Shifts in Real Wages for Workers, by Years of Schooling 1993-2009



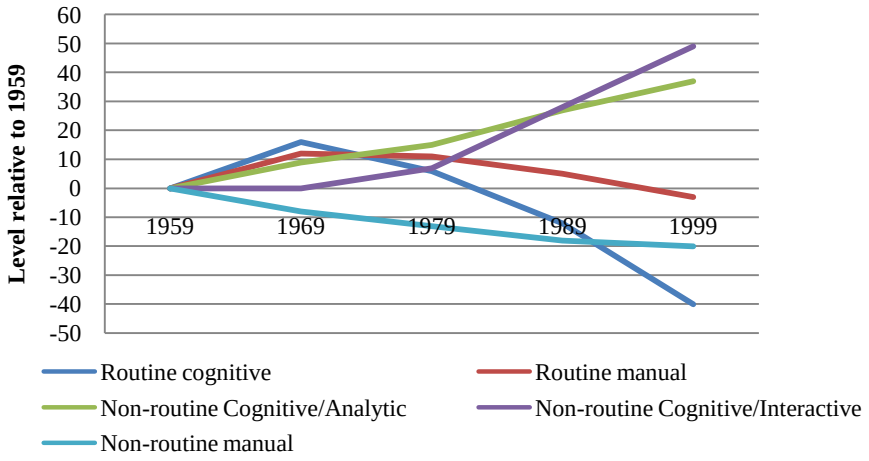
Source: PNAD

The increase in real wages for the shrinking number of individuals with very low levels of education is a very unusual phenomenon, but it has been attributed by economists such as Paes

de Barros to the impact of minimum wage laws and non-income transfers, as well as more integration between urban and rural labor markets, boosting the demand for relatively unskilled labor. [11]

Future trends? Hanushek and Woessman's evidence that countries' cognitive skill levels are strongly correlated with economic growth is consistent with recent research on long-term trends in the US labor market demand for workers with strong analytical skills. In an influential study, Autor, Levy and Murnane (2001) traced the increasing importance of "non-routine" (or higher-order) tasks within the job content of major occupational categories in the US economy – and the declining importance of "routine" tasks. (Figure 12) Their research showed that many cognitive tasks that used to be performed by workers with modest levels of education are now implemented by computers and many manual tasks with little skill requirement have been moved to off-shore production. At the same time, the data suggest that computers have become good complements for the performance of more educated workers in complex tasks, increasing their productivity. There is also an observable trend towards more complex, often team-based, activities which create labor demand for higher level communications and interpersonal skills. This evolution has changed the demand for different skills in the labor market, which is reflected in the market returns to those skills. This evolution has been labeled "skill-biased technological change." [12]

Figure 12: Changing Demand for Skills in US Economy 1959-1999



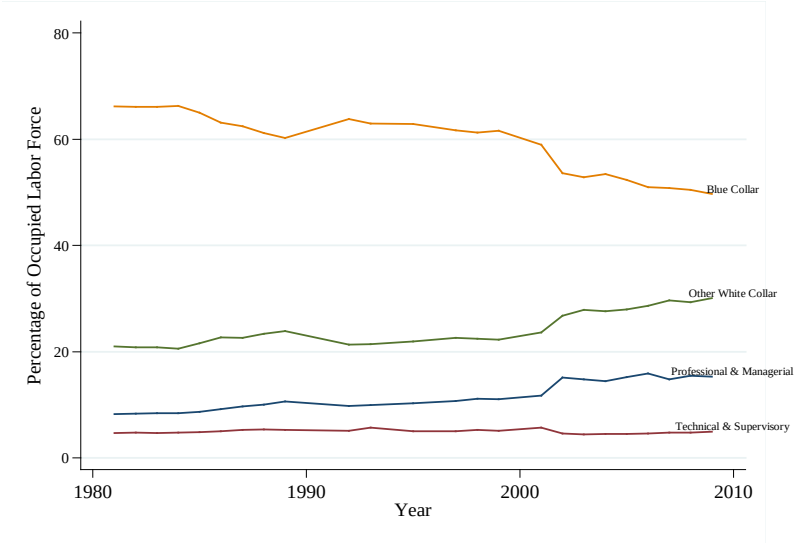
Source: Autor, Levy and Murnane (2001)

[11] See Paes de Barros, Carvalho, Franco and Mendoza, 2001, in Lopez-Calva and Lustig, Declining Inequality in Latin America, 2010.

[12] Autor, Levy and Murnane, "The Skill Content of Recent Technological Change" Quarterly Journal of Economics 118(4): 1279-1333.

We examined Brazilian occupational data for evidence of similar trends. As Figure 13 shows, the structure of the labor force is clearly shifting in Brazil, especially over the past decade. The share of workers in blue collar jobs has declined from about 60 to 50%, and professional/managerial and other white collar jobs have increased.

Figure 13: Changes in the Brazilian Occupational Structure, 1980-2009



Source: PNAD 2009

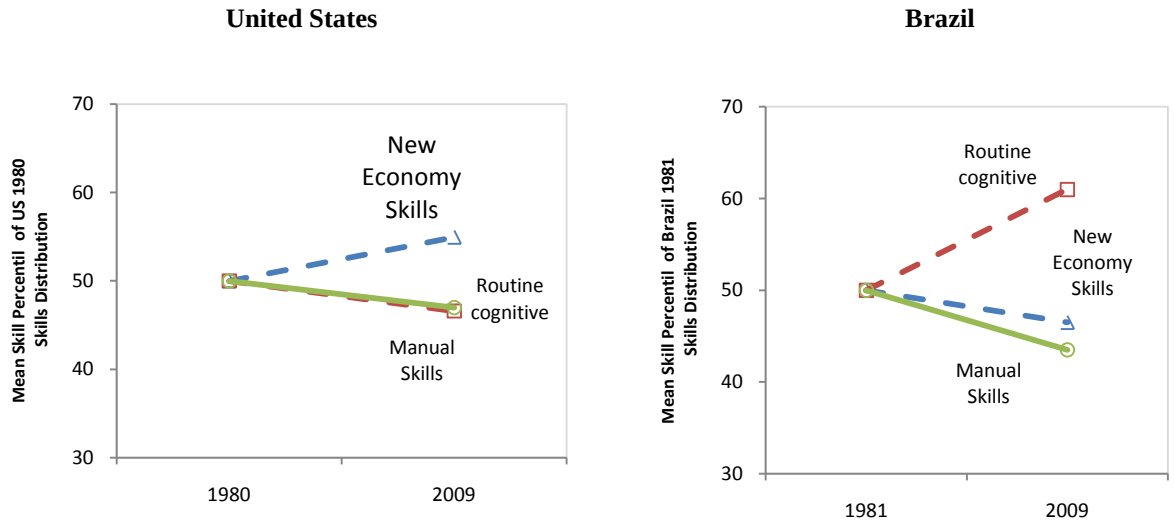
Notes: Occupational codes for each decade were mapped to the corresponding code in the ISCO-88 classification scheme. Then these codes were aggregated into the 5 categories shown in the graph.

Nonetheless, the "new economy" skill structure in Brazil remains far less pronounced than in the U.S. We carried out a parallel analysis, following the skill groupings defined by Autor et al, to examine how quickly the demand for the "higher order" analytical and interpersonal skills was growing in Brazil.[13] We bore in mind that the shifts observed by Autor et al. in the US economy occurred over a period of 40 years. Nonetheless, the U.S. data show these changes accelerated over the last 20 years, quite likely linked to the spread of personal computing and the internet. These factors might be expected to affect developing country economies in a more concentrated way, through a more rapid process of absorbing already-developed technologies.

We synthesize these findings by comparing a simplified version of Figure 12 for the US economy over the 1981- 2009 period with a parallel figure for Brazil. We combine the "non-routine" or high level analytical, interpersonal and manual skills that Autor et al christened "new economy skills" (college-educated professionals, lawyers, doctors, finance and business executives) into a single variable, and we compare this with "routine cognitive skills" (bookkeepers, accountants, audit clerks, cashiers, telephone operators) and with routine manual skills (construction workers, machine operators, cooks, agricultural labor). (Figure 14)

[13] Annex xx describes our methodology for mapping skills to occupational tasks using Brazilian labor market data.

Figure 14: Evolution of Skills in Labor Force: US and Brazil, 1981-2009



Source: Authors estimates, from Annex 5

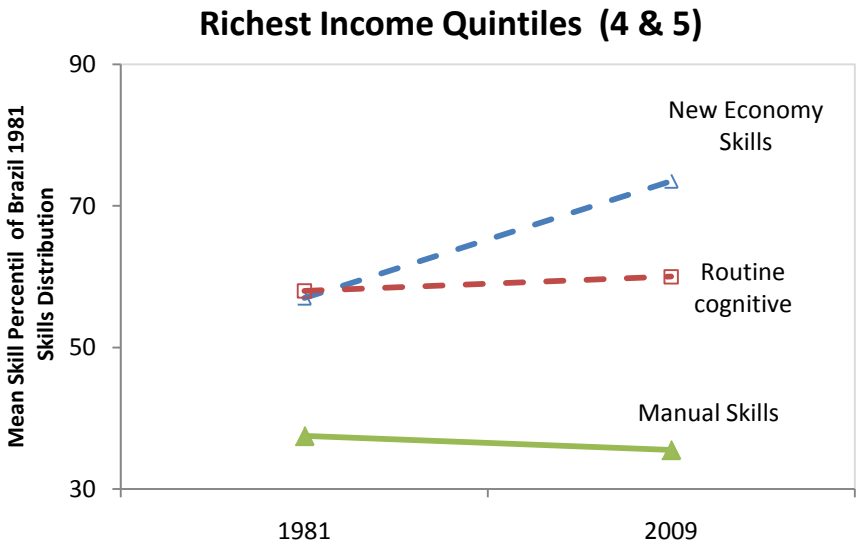
Not surprisingly, the analysis shows the Brazilian labor force has not experienced the large expansion of jobs demanding new economy skills seen in the US economy over the past 20 years. Both economies do show a relative decline in the share of the labor force employed in jobs involving manual skills. The striking difference is that while routine cognitive skills have declined in importance in the US economy –reflecting the computerization and off-shoring of many routine technical skills -- their role in the Brazilian labor market has increased. This appears broadly consistent with the growth of "other white collar" occupations in Brazil that was seen in Figure 13. The important observation for Brazilian education policy is that changes in Brazilian job content are to some extent moving in the "new economy" skill direction, though at a low speed.

Analyzing the data by income quintile, however, provides additional perspective. In the Brazilian labor force today, the top two income quintiles are employed in occupations that look very much like the US economy. (Figure 15) These jobs demand the same kind of high-level analytical and interpersonal skills as the majority of occupations in the US. The importance of jobs requiring routine cognitive skills and manual skills for the richest Brazilian has stagnated or declined since 1981.

Not all economies will converge on the labor market structure of the US, obviously. Trade openness, national comparative advantage and growth rates will influence the distribution of global economic activity, the demand for domestic factors of production and the "race between education and technology" that plays out in every country. But all available data point to rising economic returns to high-level cognitive skills in Brazil, as in the OECD and other middle-income countries. These "21st century skills" include the ability to think analytically, manage large bodies of information and data, ask critical questions, learn new skills, and adapt to

changing careers and employment across one's adult life. High-level communications/interpersonal skills – including foreign language mastery and ability to work effectively in teams and in collaborative tasks -- are also important. OECD education systems are focused on how to build these competencies, too. These trends have major implications for the Brazilian higher education system – many of which were laid out in our 2008 report on competitiveness and innovation. The overriding implication for the basic education system is the urgency of raising student learning.

Figure 15: Skills Evolution in Top Quintiles of Brazilian Labor Force, 1981-2009



Note: distribution is anchored to the 1981 skills distribution of the entire labor force
Source: Authors' estimates, Annex 5

B. Reducing Inequality and Poverty

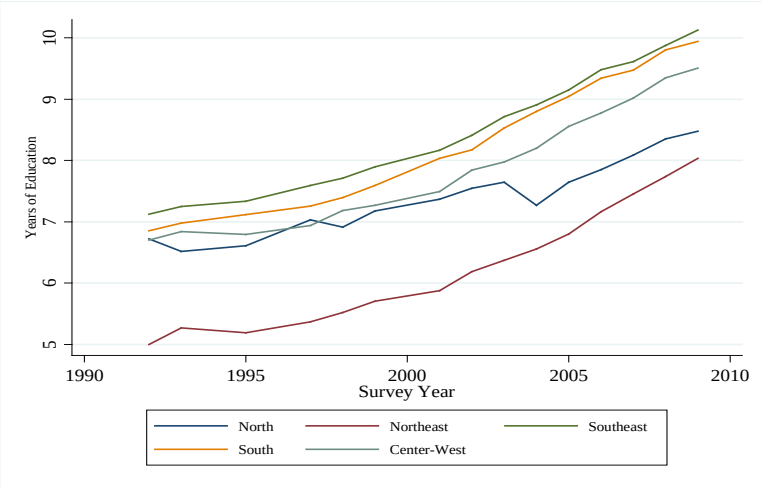
Broad-based access to education not only develops the skills of the labor force; it creates the platform for a more equal society. Education systems that function well afford talented and motivated individuals from all strata of society a route to higher skills, occupations and incomes, with the promise of upward social mobility. Brazil has historically been one of the most unequal countries in the world. On the Gini index in which European nations and Canada score between .24 and .36 (with 0 denoting perfect equality), the estimate for Brazil in 1993 was .52. Paes de Barros (2000) concluded that two-thirds of Brazilian wage inequality could be attributed to the unequal distribution of education.

The substantial expansion of schooling attainment in Brazil over the past 15 years would be expected to improve income equality and it has. Wage inequality has fallen, with the 2008 Gini coefficient for Brazil estimated as .45. This is a high degree of change over a 15 year period by global standards. Most researchers attribute the largest part of this change to increases in progressive government policies. Cash transfers to low-income families, as noted earlier, began under the Cardoso administration with the *bolsa escola*. The Lula da Silva administration

consolidated and expanded these transfers under *bolsa família*, but also instituted a major raise in the minimum wage and increased pensions. These factors likely explain the significant rise in incomes for people with limited schooling attainment over this period.

Figure 16: Regional Trends in Educational Attainment, 1993-2009

(years of schooling completed by the population aged 26-30)



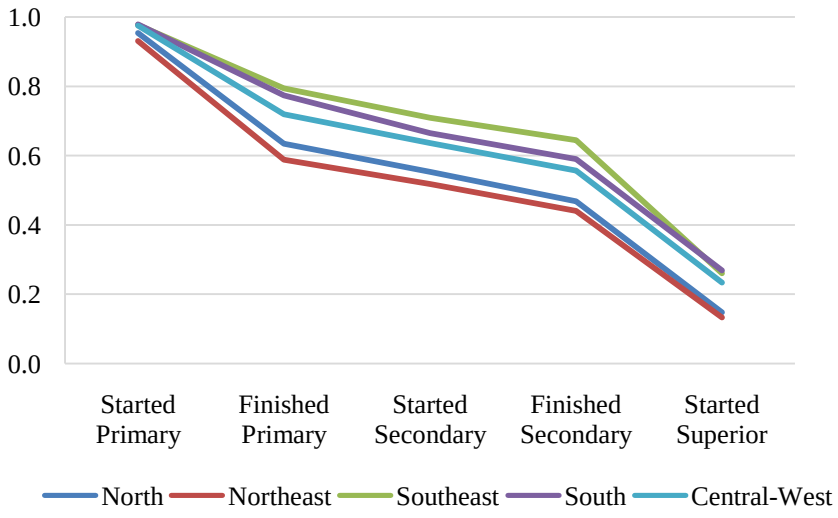
Source: PNAD, various years

But schooling access and attainment have also been broadly distributed across Brazil. Figure 16 shows the significant rise in average schooling levels in all regions over the period. The low starting status of the Northeast region is clear, and it continues to lag other regions in average schooling attainment, but it has visibly made strong progress.

There has been relatively little gap in entry to primary schooling across regions for a generation; educational disparity in Brazil opens up during the course of the primary cycle. In the Northeast, only 57% of students complete the cycle, compared with 76% in the Southeast and South. (Figure 17) For students who complete primary school, the rates of transition to secondary school, persistence in secondary school and completion of secondary school are very similar across regions. Rates of transition to tertiary education are also remarkably similar, conditional on secondary school completion. If anything, the bottleneck in access to tertiary education has been worse in the South and Southeast.

Figure 17: Schooling Attainment by Region, 2009

(population aged 26-30)

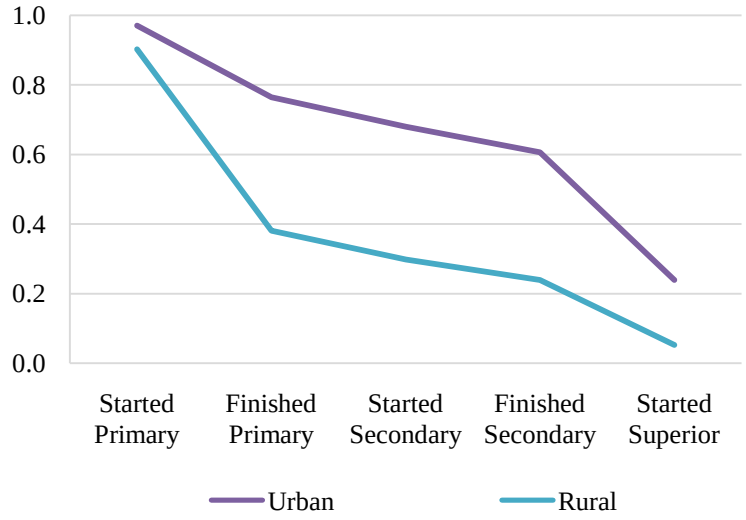


Source: PNAD

One of the most important sources of attainment differences has been rurality. At least through the 1990s, a large disparity in schooling attainment persisted between urban and rural children. It does not stem from schooling access – even 20 years ago, close to 90% of children in rural areas enrolled in primary school. But only 35% completed the cycle – far below the 75% completion rate in urban areas. Among rural children who manage to complete primary school, virtually all continue on to secondary school and they tend to complete secondary school at the same rate as children in urban areas. These patterns confirm the central challenge for Brazilian education of ensuring adequate schooling quality and increasing the primary completion rate in rural areas. (Figure 18)

Figure 18: Schooling Attainment for Urban and Rural Populations

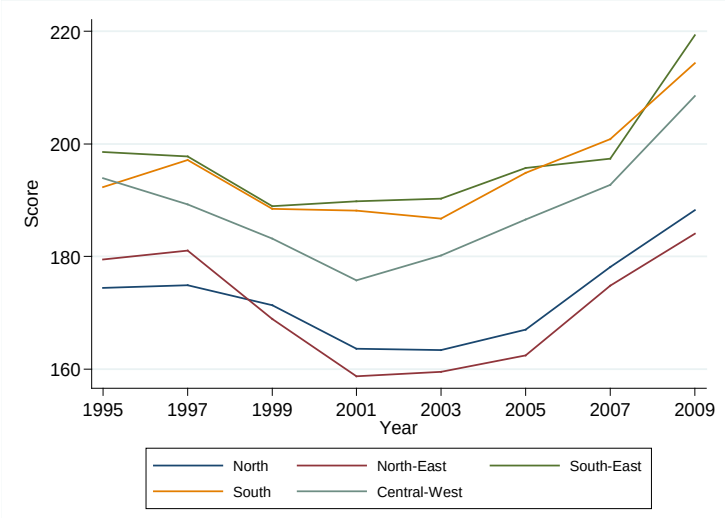
(population aged 26-30)



Source: PNAD

Cross-sectional data that reveal the schooling trajectory for children from different regions or households, such as in Figures 17 and 18, are a look in the rear-view mirror. They describe what happened to individuals who are currently adults and who started school 20 years ago. There is little question that FUNDEF/FUNDEB, *bolsa família*, and state and municipal education reform efforts have improved schooling quality in rural areas and in most rural regions – the North and Northeast. Some evidence for this is the improvement in 4th grade learning outcomes seen in these regions over the last several years on the SAEB/*Prova Brasil*. (Figure 19)

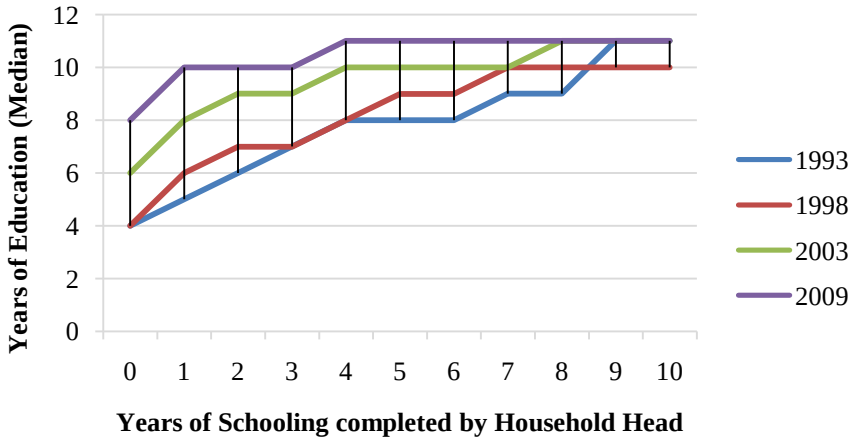
Figure 19: Fourth Grade Math Performance, by Region 1999-2007



Note: 1995-2005 scores are from SAEB, 2007 and 2009 scores are from Prova Brasil/SAEB

The expansion in secondary enrollments in Brazil has produced a significant inter-generational shift in the equity of schooling. Parental education used to be a major predictor of children's educational attainment. In 1993, secondary education was by and large only available to students whose parents had been educated to that level. The child of a father with no formal schooling would complete only 4 years of primary school, on average. This has changed dramatically. As can be seen from the top line in Figure 20, Brazilian students today complete between 9 and 11 years of schooling, regardless of the schooling level of their parents. There is a striking equalization of schooling attainment for this generation, compared to their parents – whose schooling attainment ranged from 0 -10 years.

Figure 20: Education Attainment of 20 year olds, compared to their Household Heads, 1993 - 2009

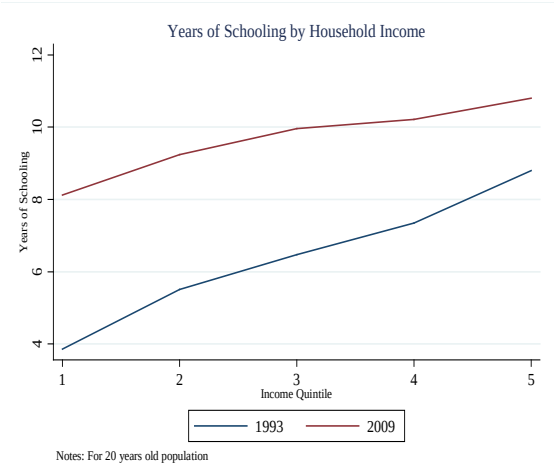


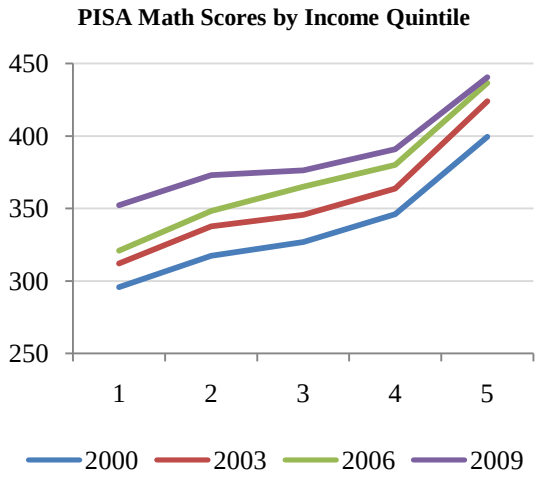
Source: PNAD

The doors to schooling are clearly open to children from all families in Brazil. And policies such as *bolsa família* have helped to narrow the gap in average schooling attainment between children from the top and bottom income groups over the past decade and a half. Learning outcomes for students from the lowest income quintiles have also improved, and the rise in PISA scores for the two lowest income quintiles over the past three years is particularly impressive. Unlike some of the other Latin American countries that participated, Brazil boosted PISA scores more for the lowest income groups than for the richer quintiles. (Figure 21) But there is still a road ahead. Household income remains the best predictor of what level of schooling a child will attain, and although the gaps in both schooling attainment and learning levels between the top and bottom income quintiles have both narrowed, they are far from eliminated.

In Brazil as in other countries, however, the issues underlying the low educational attainment of children from poor families become more complex over time. Physical access to schools and household budget constraints recede in importance, while social issues (teen pregnancy, gang and drug involvement), family instability (unemployment, domestic violence and homelessness) and learning issues and developmental deficits stemming from children's earliest years become more prominent. These issues essentially affect the demand side of schooling – the willingness and ability of students to make use of the educational services they are offered.

Figure 21: Years of Schooling Completed and PISA Math Performance, by Household Income Quintile





Sources: PNAD 1993 and 2009, PISA data 2000-2009

The quality of schooling available to low-income students in Brazil may on average be lower than in higher-income areas. But there is less evidence to support this. What is emerging from recent research in Brazil presented in Chapter 3 of this report – and consistent with the latest research in the US and elsewhere -- is that there exist large variations in teacher quality and effectiveness across different classrooms *within* the same school (whether in a high or low income neighborhood) that dwarf the variations in average quality *across* different schools. Certainly, student learning performance in the federal technical schools and high-fee private schools in Brazil is dramatically higher than in public systems. But controlling for student background characteristics, most of the gap disappears.

What does remain visible in Brazil is a "culture" among some teachers that poor children cannot learn. This issue, and how the most progressive education secretaries across Brazil deal with it, is discussed in Chapter 3.

If the core equity issue in Brazilian education has shifted from equalizing *access* to equalizing *learning attainment*, what are the strategies for addressing this? Secretaries of basic education across Brazil are increasingly focused on two major strategies, which are both consistent with global best practice:

- *Preventive interventions* -- Expanded ECD services for low income families
- *Remedial interventions* -- Remedial tutoring, accelerated learning programs, extended school day and other programs targeted children with special learning needs, emotional needs or other disadvantages, to help them keep up with their peers and stay on grade-level

ECD: Equalizing the playing field from birth. Research on early childhood brain development is generating powerful evidence of the stark divergence in cognitive function that takes place in the earliest years of life between children from advantaged and disadvantaged home environments. However, evidence from the United Sates, Argentina and Bolivia among other countries also shows that early child education programs, especially high-quality, targeted programs, can prevent these deficits in the cognitive and longer-term education performance of the poorest children from arising.[14] With the extension of FUNDEB financing to cover crèche and ECD enrollments, municipal education secretariats across Brazil are scrambling to extend existing services and experimenting with new models. There is a widespread recognition that the next critical social challenge in Brazil is protecting the human potential of the young children born into disadvantaged families.

Bolsa Família has created not only an efficient program of income transfers but also an administrative mechanism for reaching and tracking the progress of poor households. Progressive municipal education secretaries are developing ways to link *bolsa família* with direct actions to ensure that children in poor households have access to adequate health screening, nutrition, and cognitive and social stimulation from birth. Some of the most promising approaches are discussed in Chapter 3. The key message here is that access to ECD services remains highly constrained for the lowest income groups in Brazil. But it will be crucial for long-term progress in raising educational attainment of low-income children.

Remediating learning gaps: helping kids catch up. Children from low income families are by no means the only students with learning disabilities, attention deficits, physical or emotional issues that can challenge teachers. But the poorest children are often a disproportionate share of those who either start school behind in learning or fall behind. Brazil has an entrenched tradition of making slow learners repeat grades. In the next section we assess this policy from an efficiency standpoint. Here we focus on the equity implications.

PNAD data reveal that children from the lowest income quintile spend, on average, three extra years attending school in order to complete primary school. They have the lowest primary school and secondary school completion rates, mainly because as they advance in age, these students find that the opportunity costs of remaining in school to complete the cycle become prohibitive. Brazil's high rates of grade repetition and the age-grade distortion they create have no parallel in the OECD world or even elsewhere in Latin America. Only a handful of francophone African countries repeat students at the Brazilian pace.

A large amount of the program innovation going on in Brazil today – much of it supported by influential foundations – is aimed at developing effective remedial learning programs. These take a wide range of forms. One of the largest scale efforts to date is the *Reforço Escolar* launched by Rio de Janeiro municipality in 2009 – which tests all children before the school year

[14] For evidence from the United States, see Almond D and J Currie, "Human capital development before age five," NBER Working Paper 15827, 2010. For Argentina, see Berlinski S, S Galiani, and P Gertler, "The effect of pre-primary education on primary school performance," Journal of Public Economics 93 (2009) 219-234. For Bolivia, see Behrman J, Y Cheng, and P Todd, "Evaluating Pre-school Programs when Length of Exposure to the Program Varies: A Nonparametric Approach." Review of Economics and Statistics 86(1): 108-32, 2004.

and provides two weeks of intensive tutoring to all children not on grade level. In 2010, the program provided special math and reading reinforcement to over 200,000 students.

The State of São Paulo developed the first "accelerated learning" program (*Programa de Correção de Fluxo*) for the first cycle of Basic Education in collaboration with the non-profit foundation CENPEC (*Centro de Estudos em Pesquisa Educação e Ação Comunitária*) in 1995, targeted to students with high age-grade distortion.[15] The following year, the State of Paraná worked with CENPEC in 1996 to expand the program into the second cycle of Basic Education.

The private sector has been active in supporting public school systems in this area. CENPEC now supports accelerated learning programs in 16 states across Brazil and numerous municipalities. These programs group students with age-grade distortion into separate classes and providing them a redesigned, thematically-focused curriculum. The *Fundação Roberto Marinho* has developed a range of *Telecurso* programs, geared to students in the last three grades of primary school and in secondary school. These programs use one specially-trained teacher to teach an accelerated learning course across all subjects that is supported by sophisticated video/DVD programs. The pedagogical approach emphasizes classroom discussion to ensure that students are engaged and internalize the material. The programs manage to condense the last three grades of the primary school curriculum into just one year and the three year secondary cyle into 18 months. The program has been adapted in several states and municipalities, such as Acre, Amazonas, Pernambuco, the State of Rio de Janeiro, and the Municipality of Rio de Janeiro. For younger students, the *Instituto Ayrton Senna* has developed *Se Liga* to help prevent age-grade distortion by ensuring that children in early grades who have not mastered basic reading skills get extra help to do so. For young children who can read but are at risk of grade failure, the *Instituto Ayrton Senna* developed *Acelera Brasil*, which delivers two years of content in one year. This program is being used, among other places, in Paraiba, Piauí, Tocantins, and the Federal District.

Despite the broad reach of these programs, rigorous evidence of their effectiveness and cost effectiveness is essentially non-existent. Anecdotal evidence highlights many success stories but fails to capture high dropout rates in some of the programs as well as – in some cases – their high costs. As these initiatives continue to spread, the need for evidence on the effectiveness and cost effectiveness of different approaches is growing. Rigorous evaluation is a tool for policymakers to make smart decisions about how best to improve education results within finite budgets. It enables policymakers to know just how much it will cost to achieve certain gains. The highly regarded Poverty Action Lab in the United States (at MIT, the Massachusetts Institute of Technology) is working to generate this kind of evidence from innovative programs across the world. Figure 22 provides an example of their work comparing the cost of achieving an additional year of schooling via very different types of programs tried and rigorously evaluated in places as disparate as Madagascar and Mexico. As we discuss later, Brazil – with over 5,500 education systems – provides an extraordinary opportunity to learn from a great range of education programs within arm's reach of each other; but such learning is only possible with high-quality impact evaluations that use rigorous methods and common metrics.

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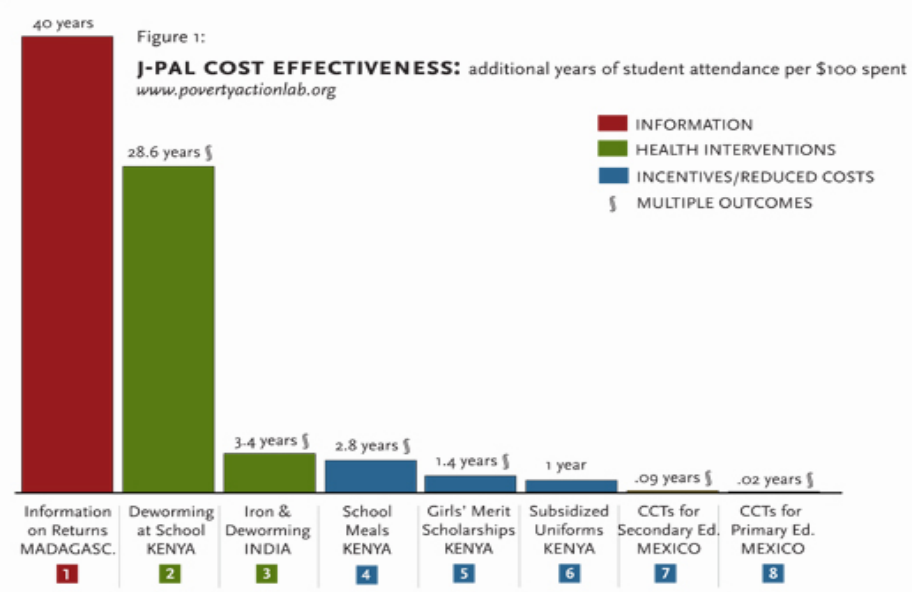
[15] See Reali A, D Donato, J Fogaça, L Ortega, L Faria, and P Bruno, "Classe De Aceleração: Diferentes Visões De Alunos Egressos E Professores," 2006. www.alb.com.br/anais14/Sem06/C06002.doc

Figure 22: Cost Effectiveness of Alternative Education Programs

(Additional Years of Student Attendance per $100 Spent



Source: www.povertyactionlab.org

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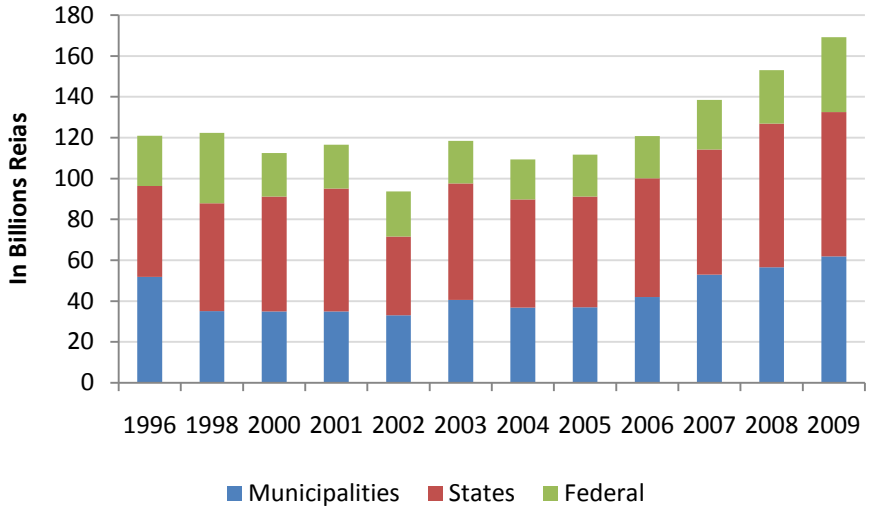
C. Transforming spending into education

The third critical task of any education system is to transform education financing into education results – above all, learning outcomes. This report has pointed to major advances in Brazilian education over the past 15 years. Now we look at the financing of that progress.

Brazil's public spending on education as a share of GDP is high. Education spending in Brazil was stable in real terms under Cardoso, but after a sharp dip in 2002 has increased rapidly under Lula. (Figure 23) Spending per student at all levels of the education system – from crèches to post-graduate universities – is on an upward trajectory in real terms. In 2009, education accounted for 16% of consolidated public expenditure in Brazil. In 1995, Brazil's national education spending of 3.7% of GDP badly trailed the OECD average of 5.5%. But that is no longer true. Brazilian now spends 5.2% of GDP on education, against an OECD average of 5.7%.

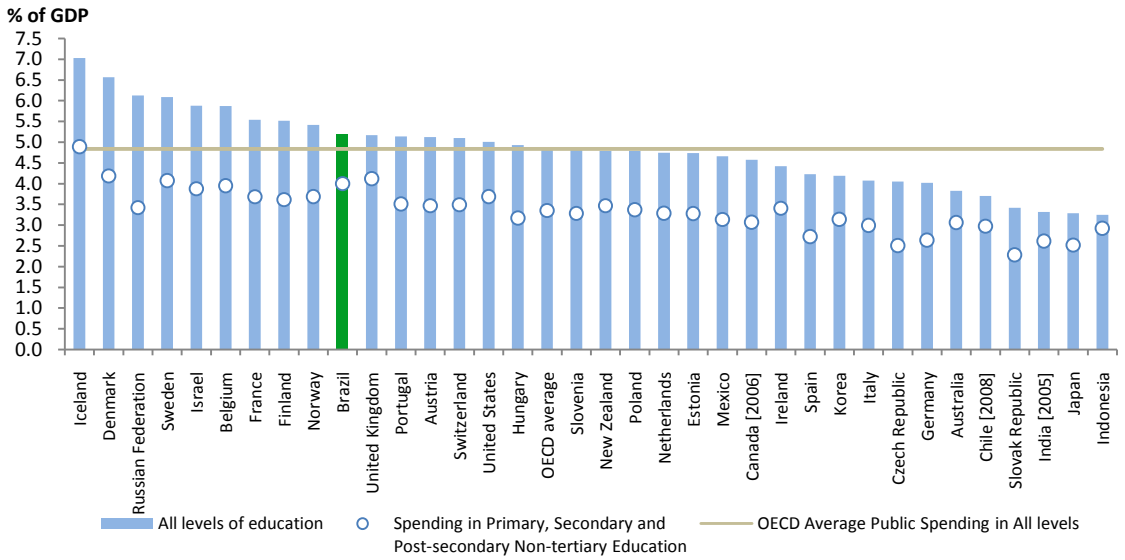
Figure 23: Consolidated Education Spending in Brazil, 2000-2009 (Constant 2009 Reais)



Source: Brazilian National Treasury

How much spending is enough? Global comparisons provide some perspective. First, while overall education spending for the OECD is estimated at 5.7% of GDP, this includes public and private spending. Average *public* education spending is 4.8% of GDP across the OECD. Since data for Brazil do not include private sector expenditure, this is the most direct comparator. Brazil's current level of public spending is above the OECD mean. (Figure 24) As the school-aged share of the population is larger in Brazil than in most OECD countries, this is to be expected. However, as Figure 24 shows, Brazil also spends a higher share of GDP on public education than Mexico, Chile, India and Indonesia, which have similar demographic profiles.

Figure 24: Public expenditure on education as a percent of GDP 2007, OECD and Brazil



Source: OECD (2010). Education at a Glance. Table B2.4

Second, GDP is growing faster in Brazil than in most of the OECD. The same national spending share will translate into higher resources per student over time. Fast growth enabled Korea for decades – and is enabling China now – to achieve significant improvements in education coverage and quality at a stable share of GDP.

Finally, and most importantly, there is a lot of variation underlying the OECD averages – both for public and total education spending. The key question is how these spending shares correlate with national performance on internationally-benchmarked tests such as PISA. Comparative studies have found no clear link. Public education spending in high-performing countries such as Korea, Japan, Australia, the Netherlands and Canada is below the OECD public sector average, but governments in high-performing Finland and Norway spend more. Countries which spend well above the average, such as the US, have seen declining performance on recent rounds of PISA. And countries that have upped their spending fastest over the past decade – such as the UK, rising from 4.9 to 5.8 percent of GDP – have failed to see globally-benchmarked learning results improve.

Brazil's education ministry and the public-private coalition supporting "Education for All" (*Educação para Todos*) have committed to a spending target of 7% of GDP by 2015. Union leaders in Brazil call for a national target of 10% of GDP. Global comparative data suggest that these levels of investment would be extremely high. Most importantly, global data suggest that targeting spending, rather than results, is an uncertain route to education progress.

The impending "demographic dividend". Proposed increases in education spending do not appear to factor in the impact Brazil's demographic transition will have on the school-aged population over the next decade. To put this in perspective, the number of students in primary

education ***tripled*** between 1950 and 1990, a period of rapid population growth and expanding access to schooling. But since 1990, although coverage continued to increase, the number of students in primary education has remained approximately 30 million -- because the school-aged population was stabilizing. (Figure 25)

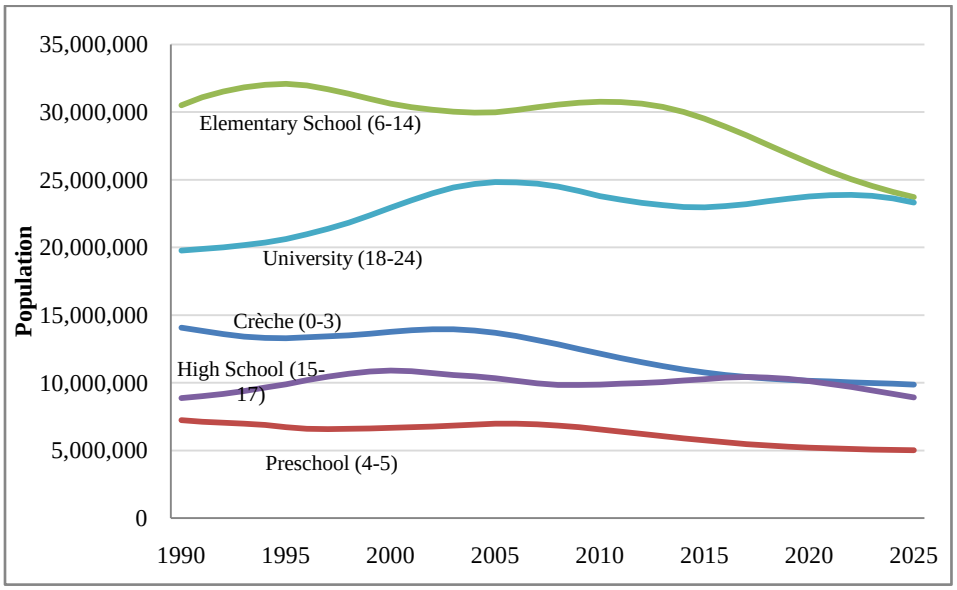
This will change dramatically after 2012. The huge, 56% decline in fertility Brazil has experienced over the past 25 years[16] will begin to produce a radically declining school-age population. From 2012-2025 only the university aged cohort will remain relatively stable in size. The shrinking number of students at every other level will be felt sharply. The South and Southeast regions will lead in this drop, followed by the Center-west and – finally – the Northeast and the North.[17] In primary education, the massive 23% drop will mean almost seven million empty seats in classrooms across Brazil. Were Brazil to follow the Korean example and maintain its current pupil-teacher ratio throughout the transition, the teaching force would decline by over 200,000 (from 840,000) primary teachers by 2025.

Table 6: Projected Declines in Schooling Cohorts, 2010-2025

Level of Schooling	% Population Decline
Crèche	19%
Preschool	24%
Elementary School	23%
High School	10%
University	2%

Source: IBGE

Figure 25: Projected evolution of Schooling Cohorts, 1990-2025



Source: IBGE

[16] Wong, LR, and JAM de Carvalho, "Age Structural Transition in Brazil – Demographic bonuses and emerging Challenges," Committee for International Cooperation in National Research in Demography, 2004. Birdsall, Bruns and Sabot (1998)

[17] Although age-specific population projections are not available, the 2000 Demographic Census suggests this ordering based on the proportions in primary education at that time.

This transition truly is a dividend for the education system. At similar points in their history, the United States, Japan, Korea, and European countries used declines in student numbers to shift resources towards quality. In Brazil, some of the resources saved from primary education could support the expansion of crèche care and pre-school, which are still far from universal and which research shows are among the best strategies for ensuring that children arrive in primary school ready to learn. It could substantially help finance the expansion of higher quality, full-day schooling at the secondary level. The seven million empty seats in primary school could also finance investments in quality for the 24 million primary students who will remain.

In sum, population decline and economic growth will generate an automatic rise in spending per student across the Brazilian education system over the next decade, without any change in public education spending as a share of GDP. Indeed, without explicit planning for these trends, there is a risk of near-term investments in primary and pre-school infrastructure that could be wasted. A more promising strategy than targeting increases in education spending as a share of GDP is to focus on the kinds of results other countries have achieved with similar levels of investment. Korea held the share of GDP for education stable during their "demographic bonus" years from 1970-1990, yet registered big improvements in results.

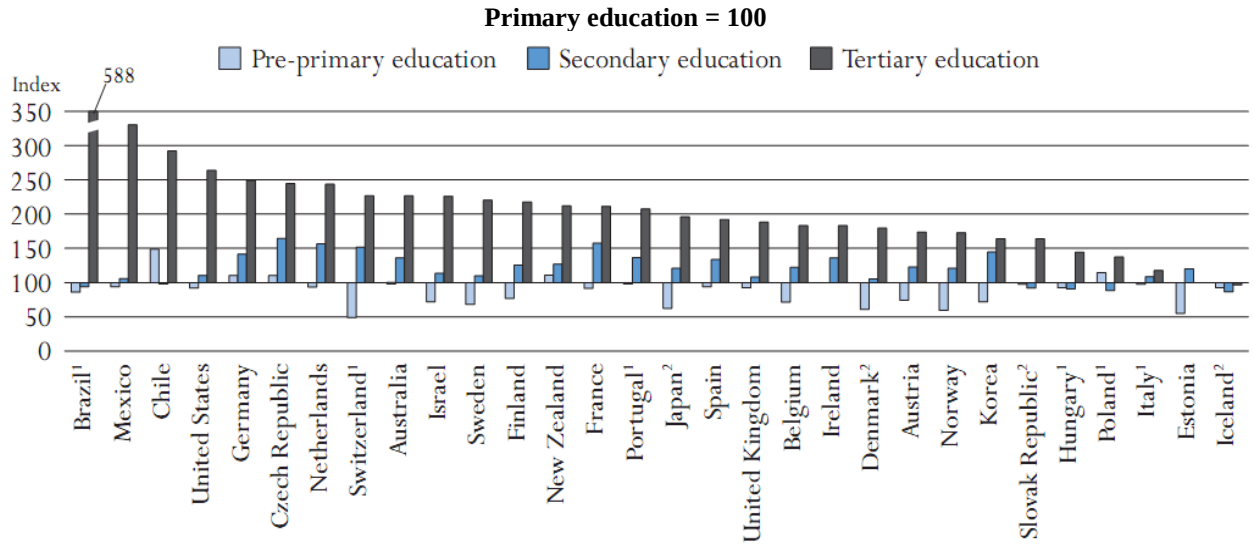
Why current spending isn't producing better results.

There are five areas that international comparative data and recent research suggest are worth examining, for better results at the current level of education spending.

- Allocation of spending across education levels

This report does not cover tertiary education, and without analyzing the quality or effectiveness of Brazilian tertiary education, it is impossible to evaluate the efficiency of expenditures at that level. But there are obvious anomalies in the allocation of public funds across different levels of education in Brazil compared with other countries. While every OECD country spends more per student in tertiary education than at the primary level – on average twice as much – the ratio in Brazil is extreme: almost 6 times as much. (Figure 26) No other country approaches the Brazilian cost structure. The issue is not the share of GDP Brazil devotes to tertiary education; that share (0.75%) remains well below the OECD average of 1.5% of GDP, although for most countries, private spending is a substantial part of this. The issue is the very small number of students in public higher education relative to spending.

Figure 26: Spending per student at different education levels relative to unit costs in primary education (2007)



Note: A ratio of 300 for tertiary education means that expenditure by educational institutions per tertiary student is three times the expenditure by educational institutions per primary student.
A ratio of 50 for pre-primary education means that expenditure by educational institutions per pre-primary student is half the expenditure by educational institutions per primary student.
1. Public institutions only (for Italy, except in tertiary education).
2. Some levels of education are included with others. Refer to "x" code in Table B1.1a for details.
Countries are ranked in descending order of expenditure by educational institutions per student in tertiary education relative to primary education.

OECD data also indicate, however, that policies have moved in a sound direction since 2000, with a significant increase in the number of public higher education students and a smaller increase in spending, resulting in a 15% decline in spending per tertiary student over the decade. Over the same period, spending per primary student rose more than 80%. There is little question that government policy is aiming at a better balance. But the staggering disparity in unit costs that remains puts the slow pace of this progress in perspective.

Brazil is also an outlier in its low per student spending at the secondary level. Only a few OECD countries (all from the former East bloc) spend less per secondary student than per primary student, but this is the case in Brazil. Unit costs at the pre-primary level are also lower than in primary education, but this pattern is more common.

Secondary education retains the character of an afterthought in Brazil – night classes in primary buildings, short (3-4 hour/day curriculum), limited laboratories and other facilities. Teachers typically work in several different schools and have little opportunity for joint planning with colleagues, or even lesson preparation and homework grading. Whether this level of education is viewed as preparation for tertiary education or as the terminal level of schooling, it needs to equip students with strong analytical, literacy and numeracy skills and the capacity to manage information, solve problems and continue learning. Most OECD countries are giving this level of education increasing resources and attention. Brazil is clearly lagging in this regard.

- Persistent high repetition and high costs per graduate

One of the most glaring sources of spending inefficiency in Brazil is the high rate of grade repetition. A high share of Brazilian youths remain in school until age 18 – enough to complete secondary school -- but end up leaving school having completed only primary education. Brazil has the highest grade repetition rates in the world outside of a very few countries in low-income Africa. International research-based consensus is that repetition is not an efficient educational strategy. Requiring slow learners to repeat grades forces them to spend a lot of hours in school for marginal increases in learning. Although rigorous evaluation evidence is limited, the widely used alternative strategy in other countries is timely remedial intervention during the course of a school year, such as extra tutoring targeted to students falling behind. Every school in Sinagapore has special rooms and a dedicated corps of experienced teachers available to provide one-on-one sessions to students who start to lag, until they are back on track. An innovative approach launched by Rio de Janeiro municipality in 2009 is a two week period of system-wide *Reforço Escolar* described earlier. All students are tested and those not ready for the next grade receive an intensive two learning reinforcement course.

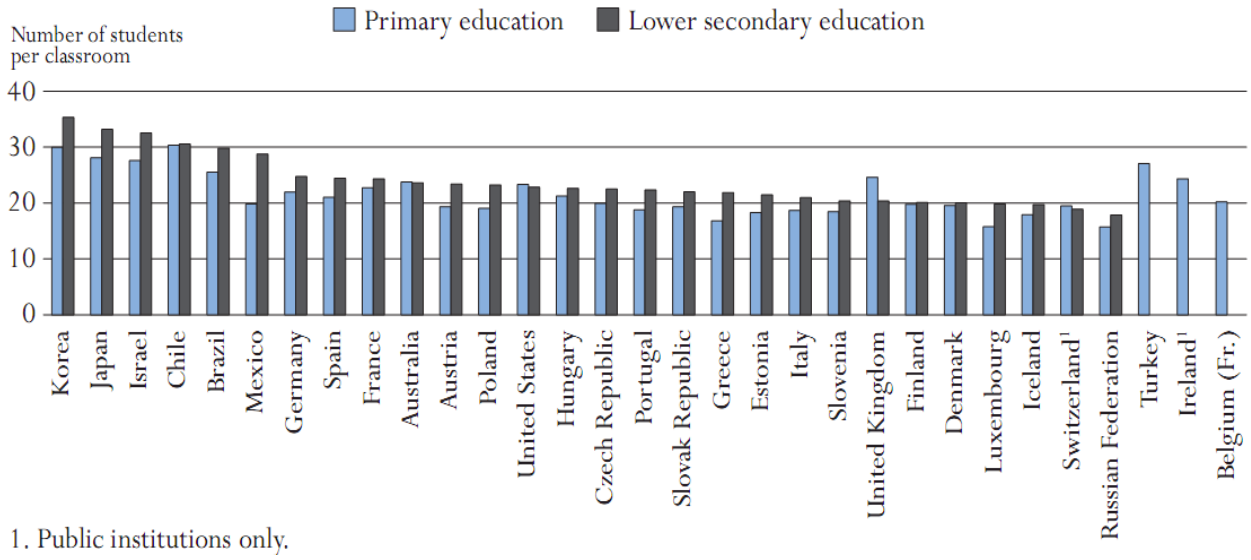
High repetition is inefficient not only because it wastes students' time and system resources, but also because it contributes to higher dropout rates. Approximately 30 percent of Brazilian students drop out before completing primary school, after having stayed in school for 11 years on average – more than enough time to complete the 8 year primary cycle, had they not repeated grades. Approximately 25 percent of secondary students drop out before graduating, after having spent 4 years trying to complete the 3 year cycle. Indeed, more than 15 percent of students in Brazil are over 25 years old when they complete secondary school.[18] No other country in the OECD survey has anything close to this degree of age-grade distortion. These high rates of dropout and repetition contribute to greatly elevated costs per graduate. A conservative estimate is that the Brazilian education system spends over Rs 11 billion per year (more than 12% of total basic education spending) on students repeating grades.

- Rising teacher costs

Chapter 3 looks in some depth at the central issue of teacher quality. From the standpoint of spending efficiency alone, however, Brazil has pursued several policies over the past decade that have raised teacher costs, with little evidence (either in Brazil or elsewhere) that they contribute to improved results. The first is a policy of lower class size. There has been a consistent decline in the pupil-teacher ratio in both primary and secondary education over the past 15 years. At the primary level, average class size has fallen from 33 in 1999 to 25 in 2008. At the secondary level, it declined from 39 to 30. *Ceterus paribus*, a decline in the pupil teacher ratio means an increase in per student costs. Average class size in Brazilian primary education is now close to the OECD average of 22. (Figure 27) Efficiency-minded countries such as Korea, Japan and Chile have resisted this trend and retain an average class size of about 30. As the size of the school aged cohort declines in the coming decade in Brazil, it will require active management from policymakers to avoid further declines in class size, which increase schooling costs without real promise of better results.

[18] OECD 2010 Education at a Glance, Table A.2.1, p. 54

Figure 27: Average class size in educational institutions, by level of education (2008)



Countries are ranked in descending order of average class size in lower secondary education.
Source: OECD. Table D2.1. See Annex 3 for notes (www.oecd.org/edu/eag2010)

The second policy is increased teacher qualifications. Brazil was clearly an outlier a decade and a half ago, with the low average schooling level of its teachers, and the rise in teacher salaries and qualifications mandated by the FUNDEF reform was in order. Those policies successfully raised the share of teachers with tertiary degrees from 20% in 1996 to 58% in 2006.[19] As qualified teachers enter the public sector salary scale at a higher level, the shift in the average level of teachers' academic preparation shifted the wage bill upwards.

The issue for education policymakers is the substantial research evidence that teachers' formal academic qualifications have little correlation with their effectiveness in the classroom. When Hanushek, Rivkin and Kain reviewed 170 estimates of the relationship between teachers' formal education and student performance, 86% of studies showed no significant relationship, and another 5% actually found a negative relationship. [20]

The final trend is a secular increase in wages for public sector teachers, on top of the shift induced by higher qualifications. There has been a steady rise in average teacher salaries relative to salaries for other occupations in the private sector, other occupations in the public sector, and to teacher salaries in the private sector (controlling for teacher qualifications and other personal characteristics).21 Moriconi (2008) found that the 40% of teachers who only have a secondary school degree currently enjoy a substantial wage premium in the labor market, with average pay

[19] Menezes-Filho, N.A. and Pazello, E.T. "Do Teacher Wages Matter for Proficiency? Evidence from a Funding Reform in Brazil. Economics of Education Review, vol. 26, p. 660-672, 2007.
[20] Rivkin, Hanushek and Kain, 2005. Hanushek, RA and SG Rivkin, 2004, " How to improve the supply of high quality teachers," Brookings Papers on Education Policy 2004, edited by Diane Ravitch.
[21] Lozana, Moriconi, Rocha and Portella, "Who wants to be a teacher in Brazil?" Fundação Lemann, June 2010.

about 34% higher than they could earn in the private sector and 20% higher than they could earn as teachers in the private sector. Wages for public sector teachers with a higher education degree still lag those in other sectors, but they have also improved significantly. Whereas in 1995 they were 60% below the average wage for a person with tertiary education in other occupations in the private sector, 60% below other public sector wages, and 30% below the average wage for private sector teachers, those gaps are much smaller today. The essential question, which we address in Chapter 3, is whether the progress made in raising average teacher salaries is enough for a world class public education system. We note here simply that the significant increase in salaries in real terms has contributed to higher unit costs in education.

All three policies – lowering class size, raising teacher qualifications, and raising real salaries -- are among the most common strategies for educational improvement employed across the world. In the case of Brazil, where teacher qualifications and salaries were historically low, these policy directions were clearly justified. The question we explore more fully in the next chapter is whether the costs of these policies have been matched by their benefits in terms of education system improvement.

- Innovation, privately-supported programs, and substantial investments in new technologies with little cost-effectiveness research

Brazil's highly decentralized basic education framework – with 26 states, a federal district, and over 5,500 municipal education systems – makes the country a natural "innovation lab" for education policy. Thousands of promising new initiatives are launched each year in public systems. A significant number of private foundations are active in program development and providing implementation support to states, the federal district, and municipalities across the country. States and the federal district are beginning to making heavy investments in information technology (one laptop per teacher, bio-scanned fingerprints to digitize attendance) and other large scale innovations. Most are creatively aimed at Brazil's most serious educational issues. But strikingly few are rigorously evaluated. There is little question that the efficiency of education spending in Brazil could be improved with more cost-effectiveness research – especially if studies were focused on programs of high relevance across different states and results were widely shared.

- Corruption and mismanagement of education funds

Research in a number of countries has documented substantial "leakage" of public funding in the flow from central ministries to "front line" service providers, whether schools or hospitals. In one well-documented case, it took concerted government action over an 8 year period to raise the share of education funds reaching schools from 13% to 80%.[22] Public expenditure tracking studies across several different developing countries have found that 30% or more of centrally-allocated education funds fail to reach the school level.[23]

[22] Reinika and Svensson, Uganda.. Filmer PNG, etc. PETS
[23] Bruns, Filmer and Patrinos (forthcoming) Making Schools Accountable: New Evidence on Accountability Reforms, 2011

No data exist on the extent of education funding leakage in Brazil under the still-significant number of federal government programs that transfer approximately Rs 5 billion per year in discretionary funding to municipalities, states, the federal district, and even directly to schools for different programmatic objectives. But there *are* data on the efficiency of FUNDEF/FUNDEB transfers, which are by far the largest source of education financing.

By instituting a transparent capitation-based formula for the allocation of education monies across different states and municipalities, and establishing local commissions expressly designed to monitor how funds were utilized, an explicit goal of the FUNDEF/FUNDEB reform was to rupture past patterns. FUNDEF's architects sought not only a radical improvement in the equity of education spending in Brazil, but also an attack on the long-standing culture of *clientelismo* – or the transfer of public funding in exchange for political support. The evidence reviewed earlier in this report is that under FUNDEF/FUNDEB funding *has* flowed in new directions and education spending *has* become more equitable.

But many local commissions did not assume the active oversight role federal reformers had envisaged, and in May 2003 the federal government launched an unprecedented anti-corruption program – introducing random audits of municipalities to track their use of FUNDEF receipts. Under the program, the *Controladoria Geral da União* (CGU) uses a public lottery each month to generate the names of 60 municipalities which are then visited by audit teams for a one-week investigation of their education, health and infrastructure spending. Researchers Claudio Ferraz, Frederico Finan and Diana Moreira exploited this data base for an innovative evaluation of the impact of corruption-induced leakage on education outcomes.[24]

The first finding was that funding diversions were widespread. Of the first 790 municipalities audited, the CGU found evidence of corruption in 35%, through techniques such as fake receipts, over-invoiced goods and services, payments made to contractors without service provision, etc. An early CGU report estimated overall funding losses between 13-55% of FUNDEF's total budget.[25]

The second finding was that the leakage of FUNDEF resources had direct consequences for the quality of municipal education. Municipalities with detected corruption were much less likely to have adequate school infrastructure or to provide in-service training to teachers. Teachers and directors in these municipalities were more likely to cite a lack of resources as a principal concern. The centerpiece of Ferraz *et al's* research was the first direct evidence that the lower quality of services resulting from corruption had a negative impact on student learning; in municipalities where corruption had been uncovered, test scores were on average 0.35 standard deviations lower, and failure and dropout rates were higher. This degree of learning disparity is very large by global standards, where a 0.2 standard deviation difference in outcomes is a large effect.

A large strand of the global education research has tried to explain why large increases in education spending in many countries have failed to produce better results. Public expenditure

[24] Ferraz, Claudio, Frederico Finan and Diana Moreira, "Corrupting Learning: Evidence from Missing Education Funds in Brazil" April 2010
[25] Transparência 2005

tracking studies and Ferraz et al's work in Brazil shows the scope for discrepancies between spending allocated to education (at the source) and funds actually spent on service delivery on the ground. A higher share of GDP allocated to education -- in Brazil or elsewhere – will not translate into better learning outcomes unless the transparency and management of funding is adequate.

Conclusion. Viewed in a global context, the Brazilian education system of 2010 has already achieved OECD-levels of public education spending and is ratcheting up its education results in the area the counts most – student learning. However, several areas of concern should be at the top of the next government's agenda.

First, Brazil is still quite far from the average learning levels, secondary education completion rates, and student flow efficiency of OECD and other middle-income countries. Unless the education system does a better job of preparing a 21st century work force, Brazil will lose ground in global economic competition to countries with higher skilled populations, such as "BRIC" member China. As in every education system, improving teacher quality will be the largest challenge. But Brazil also faces issues in upgrading the infrastructure, instructional hours, curriculum, qualifications framework and labor market linkages in secondary education.

Second, while access to education in Brazil has become vastly more equitable over the past 15 years, there is a persistent gap in learning levels and graduation rates between rich and poor. Global research points to early childhood interventions as the most powerful strategy for truly leveling the education playing field. The federal government and municipalities have begun moving on this agenda in a major way in recent years. But coverage rates and quality indicators have a long way to go.

Third, Brazil's highly decentralized basic education system, social interest in education and new generation of results-oriented politicians are creating a unique public policy landscape. Several different states (and the federal district) and municipalities in Brazil are at the cutting edge of global education policy with teacher pay-for-performance reforms.[26] Diverse and promising approaches are being developed for ECD services, accelerated learning, early grade reading, in-service teacher support, student mentoring, school cohesion in conflict zones and many other areas. A more active role by the federal government in supporting rigorous evaluation of these different approaches and disseminating the evidence could help improve the efficiency of spending across all states, the federal district, and municipalities.

[26] Bruns, Filmer and Patrinos, Making Schools Work: New Evidence on Accountability Reform, World Bank, 2011 (forthcoming)

III. Brazilian Basic Education: 2010 –2020: The Next Agenda

This chapter examines what we see as the four most important challenges for the Brazilian education over the next ten years: i) raising teacher quality; ii) protecting the early development of the most vulnerable children; iii) building a world class secondary education system; and iv) maximizing the impact of federal policy on basic education – especially by capitalizing on the Brazilian "education action lab".

A. Building Better Teachers

Teacher quality is the central issue in education policy. While the importance of having a good teacher is intuitively obvious to any parent or student, it is only over the last decade that researchers have begun to *quantify* how crucially individual teachers affect students' average learning gains. Over the course of a single school year, students with a poor teacher master 50% or less of the curriculum for that grade; students with a good teacher can get an average gain of one year; and students with great teachers advance 1.5 grade levels or more. [27] A series of great or bad teachers over several years compounds these effects and can lead to unbridgeable gaps in student learning levels.

The hottest question in education policy and research has become how to recruit great teachers and to raise the performance of teachers already in service. The key elements sound simple: i) attract high caliber people; ii) support continuous improvement in practice; and iii) reward performance. But countries across the world are struggling to put these elements in place. Policymakers in virtually every country confront an empirical reality of teacher recruitment and compensation systems with weak links between salaries and performance. The vast majority of education systems are characterized by lifetime job tenure, rigid pay scales, and very flat career progression, with the top teacher salary after 20 years of service usually not even twice that of an entering teacher. These create labor environments where extra effort, innovation and good results are not rewarded and there are no penalties for poor performance; the rate of teacher dismissal for poor performance across the OECD is less than 3 percent.[28] This section looks at each of these issues in the Brazilian context and reviews the latest global evidence – some of it from Brazil -- on how to address them.

1. Recruiting higher-capacity individuals: Reform of teacher preparation and recruitment standards

While virtually every school system in the world recruits teachers based on formal educational qualifications and/or certification processes, research shows that these "observable" factors are not good predictors of teacher effectiveness on the job, measured as the ability to boost students' learning.[29] School systems are searching for selection standards that will do a better job of predicting which teachers should be hired and retained. Since even the most sophisticated screening systems find that some share of recruits do not perform as well as expected, there is growing use of induction systems which allow newly hired teachers a 1-2 year period of

[27] Hanushek and Rivkin, AER May 2010; Farr, 2010
[28] Daniel Weisberg et al, 2009.
[29] Rivkin, Hanushe and Kain, 2005

probation, with their classroom performance closely supervised, before a final hiring commitment is made. Even longer periods of probation are part of the strategy for raising teacher quality in fast-improving US districts such Boston and Chicago. There, teachers are not made permanent until they have been teaching and closely evaluated for 3 and 4 years, respectively. And the "pruning out" of weaker performers is a significant part of these districts' aggressive efforts to raise the bar for teacher quality. In Brazil, the *"residência escolar"* being pioneered in the Niteroi municipal system is a move in this direction. Modeled on the years of closely observed practice used for beginning medical doctors, Niteroi's system for a carefully supervised teacher probation period appears promising, although there is no evaluation of its impact yet.

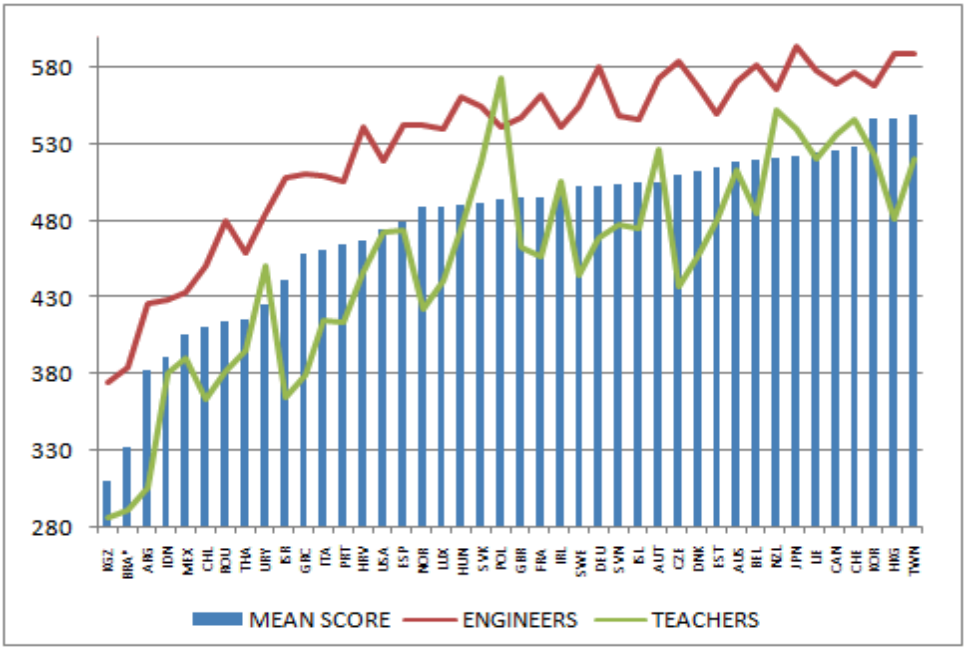
In general, global research supports the importance of high cognitive skills and content knowledge for effective teaching. Interpersonal skills, character traits such as patience and perseverance, and personal charisma clearly also contribute to outstanding teachers. But the *sine qua non* is strong content knowledge. Countries where new teachers are recruited from the top third of university graduates, such as Korea, Singapore and Finland, have the best performing education systems globally.

Who goes into teaching in Brazil? In Brazil, teachers are recruited from the bottom third of students. The country is not alone in this pattern. 2006 PISA data found that the average cognitive ability of 15 year old students who identified themselves as prospective teachers was well below that of prospective engineers in every country except Poland and below the national average in most countries. (Uruguay was the one exception in Latin America.) Even though the PISA data show this as global pattern, its implications are stronger for Brazil, whose overall PISA performance sits at the bottom of the world skill distribution for its income level. (Brazil is second from left in Figure 28.)

Brazilian researchers have documented the same pattern; teaching is a low status profession that does not attract high academic performers. In 2005, only 11% of the high school students interested in becoming a teacher were among the top 20% of graduating students, while 30% were in the bottom 20% of students. Compared with engineering students, Louzano *et al* also documented that *pedagogia* students come from significantly poorer and less educated families and are less likely to attend (higher quality) private high schools. [30]

[30] Louzano, Paula, Gabriela Moriconi, Valeria Rocha and Romualdo Portella, "Who Wants to be a teacher in Brazil?" Fundação Leman, April 2010.

Figure 28: Comparative PISA math performance of prospective teachers and engineers



Note: Brazil results are from PISA 2000. All other countries are from PISA 2006.

It is interesting to observe that the highest performing education systems globally do not always have high teacher wages (relative to per capita GDP), but they always have teacher recruitment processes that are highly selective. The number of places in teacher training programs is limited and there is competition for entry. Singapore accepts only 20 out of every 100 teacher education applicants. Finland reports nine applicants for each new opening. Selection criteria emphasize academic achievement (on university qualifying exams) but candidates are also screened for communications skills and motivation, and observed during practice teaching.

In Brazil, there is no "winnowing" of teacher candidates at entry to teacher training programs. There is a very large number of programs and the number of students has continued to grow, although about 70% of students currently are individuals with previous teaching experience in the process of upgrading their formal credentials. A recent review of a sample of graduates from 532 *pedagogia* programs found that institutional quality – measured by student performance on exit exams -- on average was not high. Test scores were highest for teachers with no previous experience who trained in public institutions, but private schools were as effective in training individuals with prior experience. The researchers hypothesize that private schools offer a less theoretical curriculum.[31]

Teacher selection in Brazil begins after teachers have graduated. The process is highly decentralized; individual states and municipalities set their own criteria and hiring process. At the state level and in many municipalities, hiring is based on written examinations (concurso) and a review of formal qualifications and candidates are ranked. In smaller municipalities,

[31] Louzano et al, *ibid*.

processes may be much less formal. There are typically no interviews or on-task evaluations, such as preparation of a sample lesson plan or teaching a sample class. Formally, there may be a probationary employment period, but it is rarely enforced.

National policies to improve teacher quality. It would be difficult and probably inappropriate for a country such as Brazil, with over 5,000 separate education systems, to aspire to a single, national teacher pre-service screening, training and selection system a la Singapore or Finland. But the Ministry of Education deserves credit for strong actions at the federal level to try to raise the bar for teacher quality across the country. It has developed a three-fold strategy.

First, to improve the quality of new teachers, the Ministry has created a new exam (*Exame Nacional de Ingresso na Carreira Docente)* for all new teacher candidates. (It will not be required for existing teachers.) The exam covers both content and pedagogy. The national exam is an important step because, while the federal government does not have the authority to revamp the curriculum of university-level education departments because of institutional autonomy, those departments will be forced to respond to the more stringent requirements of the new national teacher exam – above all the emphasis on high level content mastery in math, science and language, rather than the philosophy and ideology-dominated curricula currently used in many universities.

The *Exame Nacional de Ingresso* appears to be a good compromise between the need for more transparent and comparable information about the skills of teacher candidates across the country and the need for states, the federal district and municipalities to retain the autonomy to set standards for entering teachers that are appropriate in their particular region or context. The Ministry will not mandate any particular score that teacher candidates must attain and it will not "certify" candidates on the basis of their exam performance. But similar to the role MEC has played in providing transparent information about school results in creating the IDEB, MEC is playing an important role in generating a "public good" (information about teacher competency) that can make state and local decisions more efficient.

Second, to improve pre-service training quality, the Ministry has collaborated with the federal universities to fund 100,000 new teacher places at top universities across the country; these places will be focused on science and math teachers, which is an urgent priority in Brazil.

Third, MEC is mandating that every state, the federal district, and municipality establish a formal teacher recruitment process and a career plan. This means all recruitment of new teachers must be through an organized and transparent *concurso* (most states already do this but teacher recruitment in many small municipalities remains highly discretionary) and the establishment of a clear teacher career path. Recruitment must be based on subject matter mastery as well as pedagogy and credentials. The career plan must allow teacher to see the performance requirements for progression as well as the increases in salary.

This effort to establish a higher bar for teacher quality at entry is crucially important, and the Ministry's well-designed policies follow the lead of states such as São Paulo and Minas, that have already put in place more rigorous, content-based tests for teacher candidates. In São Paulo, tests of content mastery are also used to regulate the conversion of temporary teachers into permanent contracts.

State-level innovation: São Paulo's Prova de Promoção. With a stock of almost 2 million teachers already in service, it would take decades for Brazil to affect the overall quality of instruction solely through higher standards for the flow of new entrants. Recognizing this, the state of São Paulo in 2009 adopted an innovative complementary reform – the *Prova de Promoção* -- to create a new, high-paid career track for top teachers *within* its current 230,000 teaching force. Civil service teachers may opt into the new salary scale by passing a difficult test of content mastery. The rewards are high: from average salary of BR 1,830 (and top salary of BR 3,181) per month in 2010, the 5th and highest salary grade under the new structure will pay teachers BR 6,270 per month, decompressing the ratio of top to bottom teacher salaries from 73% to 242%. This new top level salary is the equivalent of 4 times per capita GDP annually and would place teachers in the top 10% of professional salaries nationally. Teachers must reach a high minimum test score to qualify for Level 1 of the new track (6 or more on a 10 point scale), but the fiscal impact of the reform is also controlled by a tournament rule that a maximum of 44,500 teachers per year (20% of the total teaching force) may enter the new career track, in rank order of their performance on the test.

Ninety-six thousand teachers opted to take the *Prova de Promoção* in 2010, for access to Level 1 of the new scale. Of these, 81,000 achieved the threshold score and 44,589 entered the new system. Teachers must wait 3 years in any new salary grade before they can compete for the next level, with a more demanding threshold score. The new policy creates strong incentives for current teachers to continue to acquire content knowledge and for new, high-capacity individuals to enter teaching. The São Paulo reform not only has clear relevance for other states in Brazil grappling with the same issues, it is also one of the best-designed programs of its kind in the world. To help expand the thin global evidence base in this area, the state is participating in a World Bank-supported impact evaluation of the reform, as part of a cross-country research study of teacher incentives reforms. (Box 4)

2. Improving teacher practice: Reforms of in-service training

Whatever the level of teacher quality at entry, education systems all share the challenge of developing the best teaching possible out of the teacher force in place. Part of the issue is motivating teachers to perform, which we discuss in the next section. But many researchers are convinced that, especially in settings where teachers' skill levels are low, even motivated teachers may simply not know how to improve.

The record on in-service professional development leading to measureable improvements in teacher effectiveness is dismal.[32] In Brazil, states and municipalities annually out-source a large amount of in-service training to local universities and foundations and approaches vary widely. There are a number of creative and well-regarded programs, including several we discuss in the next section, but none to date has been evaluated rigorously. Many programs, however, are delivered by university education departments that have ideological approaches, including a belief that the low quality of Brazilian education is rooted in the poverty and low development of the students. Reformist secretaries of education such as Rose Neubauer da Silva (former secretary of the São Paulo state system), Vanessa Guimarães (secretary of Minas Gerais) and

[32] Borko, 2004: Garet, Porter and Desimone, 2001; Hill and Cohen, 2001

Box 4: Evaluating the impact of São Paulo's Prova de Promoção

São Paulo's innovative effort to upgrade teacher quality by creating a selective, highly-remunerated new career track is one of a handful of such programs in Latin America and an important potential model for the region, along with Chile's AVDI (*Asignación Variable por Desempenho Individual*) and Peru's new *Carrera Publica Magisterial*.[1] The state is collaborating with international researchers to generate evidence on three important policy questions:

i) is there a correlation between teachers' score on the *Prova de Promoção* and the previous year learning results of their students? (ie, does the evidence support the hypothesis that teacher content mastery is a better predictor of classroom effectiveness than teachers' years of service or other observable characteristics?)
ii) how does entry into the new salary progression affect a teacher's effort and classroom practices subsequently; and
iii) is the existence of the new career path attracting higher caliber applicants into the state school system?

The second and third questions will take more time to evaluate, but to begin examining the first question researchers mapped the test performance of teachers who took the exam in 2010 with the learning performance of their students at the end of the 2009 school year. São Paulo's excellent administrative data made it possible to link classroom level student learning results for approximately 3500 4th grade teachers, 6,000 8th grade math teachers and 8,500 8th grade Portuguese teachers. In each case, average student performance on the SARESP (São Paulo standardized test, which is equated with the national standardized assessment) at the classroom level in math and Portuguese in 2009 was compared with Prova de Promoção scores for the teachers assigned to those classrooms in 2009. The results showed a significant correlation between teachers' level of content mastery and the prior year performance of their students, controlling for teachers' background (years of experience and level of schooling.)

A panel of 500 teachers, half of whom barely accessed and half of whom just missed the 20% cutoff for entry into the new salary scale in 2010 is being followed for the next two years to analyze how the program affects teachers' satisfaction, expectations, professional development actions, and performance in the classroom. The research proposal includes classroom observations of both groups of teachers.

One of the most important impacts of the new reform, however, will be its effect on the average caliber of entering teachers. While this can only be analyzed over time, São Paulo's 2010 concurso for new teachers (mounted after the Prova de Promoção was announced) experienced a record number of registrants – 270,000 candidates for 10,000 openings. Researchers are currently analyzing the median test scores, university preparation, and socio-economic profiles of the successful candidates and overall applicant pool in 2010 compared with those of previous years. This may show whether the new career stream, by attracting new and more qualified candidates into the teaching profession, is allowing the state to recruit more selectively. The research will also follow both new teachers and new entrants into the Prova de Promoção salary scheme over the next several years to analyze their effectiveness in raising student learning. Although the evidence from OECD countries indicates a correlation between teachers' content mastery and their classroom effectiveness, in terms of producing higher student learning outcomes, there is limited evidence on this from developing countries. The São Paulo study will be an important contribution.

Claudia Costin (secretary of Rio de Janeiro Municipality) among others have had to work hard to fight this culture, using mantras such as "every child can learn" and "if a student isn't learning, it is the fault of the schools, not the child".

The highly theoretical in-service training delivered by many Brazilian universities contrasts dramatically with new trends in teacher professional development in OECD countries. There, training is increasingly focused on transmission of concrete, practical strategies and techniques distilled from observing highly effective teachers in action.[33] Inspired by the work of researchers such as Charlotte Danielson (A Framework for Teaching), Douglas Lemov, and Teach for America's intensive teacher support program, these in-service programs emphasize several themes: the crucial importance of managing classroom time to maximize instruction, how to design lesson plans and pace activities to keep students engaged, and how to assess student progress continuously and target help to students falling behind.

Leading state and municipal secretariats in Brazil have begun to adopt this research-based approach to improving school quality. In Minas Gerais, Pernambuco, and Rio de Janeiro municipality, teams of trained observers have used a standardized protocol developed in OECD countries to conduct the first systematic classroom observations in Brazil. They are generating representative, classroom-level data on overall system performance and helping to identify highly effective teachers. This first look "inside the black box of the classroom" in Brazil is proving a rich source of information for school-level improvement planning and for the design of concrete, practical teacher development programs.[34]

Some key results are reported here. (Tables 10-14) The Brazilian data are highly consistent with OECD experience in one respect; variations in teacher effectiveness from one classroom to the next *inside the same school* in Brazil are almost as large as the variations seen across schools. Fully 75% of the variation in classroom practice observed across a sample of several hundred schools can be seen within any one of those schools. This is a staggering degree of disparity in teacher practice inside a school, but consistent with what is found in other countries. The implication for policy is clear -- and promising. If the "technology" for more effective teaching is already present somewhere in the school, the challenge is to share it more widely, and the costs of doing so are potentially low.

In other respects, however, comparing the Brazilian data with the OECD good practice benchmarks is sobering and provides a window into major issues in Brazilian education. The classroom observations measure three things: i) how the teacher uses class time; ii) how the teacher uses available materials; and iii) student engagement.

Looking across the data from Minas, Pernambuco and Rio de Janeiro municipality, a few patterns are remarkably consistent:

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[33] Lemov, Douglas, Teach like a Champion: 49 Techniques that Put Students on the Path to College, 2010; Farr, Steven, Teaching as Leadership: the Highly Effective Teacher's Guide to Closing the Achievement Gap, 2010

[34] See Annex xx for information about the sample size and characteristics and method of collecting the data in each state/municipality.

- **A high share of classroom time is lost**. In the OECD, good practice norms are for teachers to spend at least 85% of class time on instruction, no more than 15% of time on classroom administration (taking attendance, collecting homework, cleaning the room, passing out papers) and zero time on "non-academic activities" (chatting with students, leaving the classroom to get something, etc). In all of the Brazilian systems observed to date, time spent on instruction is below 66%. Time spent on classroom management (from 25-31%) is much higher than in the OECD, and non-academic activities absorb 7-12% of time. Between 3-8% of time the teacher is outside of the classroom – usually either arriving late or leaving early.

Table 7: Use of Class Time: Rio de Janeiro municipal, Pernambuco state and Minas Gerais state schools

Use of Instructional Time	Rio de Janeiro Municipal Schools	Pernambuco State Schools	Minas Gerais pilot study		OECD Good Practice Benchmarks
			Schools that Improved 2005-2007	Schools that Declined 2005-2007	
1. Learning Activities	62%	61%	66%	63%	**85%**
2. Classroom organization	31%	27%	27%	25%	**15%**
3. Non-academic activities	7%	12%	8%	12%	**0%**
3.1. Teacher out of the classroom	3%	8%	3%	6%	-
Average for all classrooms in sample					

Sources: Rio de Janeiro Municipal Secretariat of Education, Pernambuco State Education Secretariat, Minas Gerais State Education Secretariat, and World Bank

- **Traditional teaching methods predominate**. Books are used less than 20% of time. The blackboard is the principal teaching material -- used 25-34% of the time. Between 8 and 21% of time, no materials are used. Almost no use of ITC or cooperative learning activities is observed.

Table 8: Use of Classroom Materials: Rio de Janeiro municipal, Pernambuco state and Minas Gerais state schools

Teaching Materials Used*	Rio de Janeiro Municipal Schools	Pernambuco State Schools	Minas Gerais pilot	
			Schools that Improved	Schools that Declined
No Materials	14%	21%	15%	8%
Textbooks	11%	16%	19%	11%
Workbooks and writing books	28%	21%	32%	40%
Blackboard	**33%**	29%	25%	34%
Learning aids (maps, charts)	**9%**	7%	7%	1%
ICT (computer, projector, radio)	1%	3%	1%	4%
Cooperative learning activity**	**4%**	2%	2%	2%
* Proportion of total instructional time used by the teacher (ie.,the denominator is the time that the teacher was in the classroom engaged in teaching)				
**Cooperative learning activities are noted every time a group of students is working jointly on a common task, irrespective of materials being used.				

- **Students are not engaged**. Between 43-64% of the time, a small or large group of students (6 or more) is visibly "off task" (chatting, texting, sleeping, etc). The OECD benchmark is 6% of time or less.

Table 9: Share of time that a small or large group of students is off-task: Rio de Janeiro municipal, PE state and MG state schools

Activities	Rio de Janeiro Municipal Schools	Pernambuco State Schools	Minas Gerais Pilot Schools that Improved	Minas Gerais Pilot Schools that Declined	OED Good Practice Benchmarks
Large or small group of students not engaged	20%	24%	20%	37%	**6% or less**
Large or small group of students engaged in social interaction	35%	31%	41%	50%	
Large or small group of students being disciplined	0%	0.03%	0%	1%	
Large or small group of students off-task	**43%**	**46%**	**51%**	**64%**	
Large group of students not engaged	6%	6%	6%	8%	
Large group of students engaged in social interaction	15%	11%	16%	21%	
Large group of students being disciplined	0%	0%	0%	0%	
Large group of students off-task	**18%**	**15%**	**19%**	**25%**	
Small group of students not engaged	14%	18%	14%	29%	
Small group of students engaged in social interaction	20%	21%	25%	29%	
Small group of students being disciplined	0%	0.03%	0%	1%	
Small group of students off-task	**29%**	**33%**	**36%**	**48%**	
- Large group = More than 5 students					
- Small group = Two to five students					

- **Students learned more when classroom time was used more effectively**. In the top 10% of Rio de Janeiro municipality's schools measured on the IDEB, teachers spent 70% of classroom time on instruction, compared with 54% in the bottom 10% of schools. In classrooms in the top schools, teachers didn't miss a minute of official class time; in the bottom schools, teachers were absent from the classroom 3% of the time.

Table 10: Use of instructional time in top vs. bottom performing schools:

Rio de Janeiro municipal schools

4th grade classrooms	Teachers' Use of Instructional Time			
	1. Learning Activities	2. Classroom Management	3. Non-academic Activities	3.1 Teacher out of the classroom
All schools in sample	58%	37%	6%	1%
10% of schools with highest IDEB scores	**70%**	**27%**	3%	0%
10% of schools with lowest IDEB scores	**54%**	**39%**	7%	3%
Difference	0.16	-0.13	-0.03	-0.03
	[0,09]*	[0,09]*	[0,02]	[0,01]**
- Standard errors in parentheses. *Statistically significant at the 10% level, **Statistically significant at the 5% level.				

- **Students learned more when they were engaged**. In Rio de Janeiro's municipal schools scoring in the top 10% on IDEB, large groups of students were off-task only 10% of the time, compared with 28% (more than a quarter of total instructional time) in the bottom 10% IDEB schools.

Table 11: Student engagement in top vs. bottom performing schools:

Rio de Janeiro municipal schools

4th grade classrooms	Students off-task		
	Large or small group of students off-task	Large group of students off-task	Small group of students off-task
All schools	35%	13%	25%
10% of Schools with Highest IDEB scores	**30%**	**10%**	22%
10% of Schools with Lowest IDEB scores	**50%**	**28%**	28%
Difference	-0.19	-0.18	-0.05
	[0,14]*	[0,09]**	[0,11]
- Standard errors in parentheses: *Statistically significant at the 10% level, **Statistically significant at the 5% level.			

In each of the school systems observed to date, there were many classrooms that exceeded the OECD good practice benchmarks for time spent on instruction. There were classrooms where students were never off-task. There were classrooms where books, materials, ICT and cooperative learning activities were used as intensively as in the best schools in Finland, Korea or Canada. There were teachers like the "heroes" profiled in Annexes 1 and 2.

But these teachers, and their classrooms, are not the norm in Brazil today. Many teachers in Brazil resist having their work observed. But dynamic education secretaries like those of Minas, Pernambuco and Rio de Janeiro municipality are moving on many fronts to reform and improve their schools. They believe that reforms can only improve student learning if they create observable improvements in teacher practice in the classroom. Systematic research on classroom dynamics allows the impact of new programs – such as Pernambuco's innovative teacher bonus, Minas' *Alfabetizacao no Tempo Certo*, Rio de Janeiro municipality's *Acelera* and *Se Liga* partnerships and other initiatives -- to be measured rigorously over time. It allows secretaries to identify excellent teachers who can serve as demonstration teachers and in-school mentors. It can provide essential feedback for school-level development plans. Above all, it can support the design of effective teacher development programs, by focusing these on concrete, priority issues and disseminating practical, effective strategies generated from within the system itself.

3. Motivating performance: Reforms of Teacher Incentives

On the other side of the coin, teachers – like any other workers – cannot be expected to work hard at developing and applying their skills unless their effort is rewarded. There is considerable cross-country evidence that teachers respond to many different types of incentives, including many non-monetary incentives (intrinsic motivation, professional growth, feedback from students, recognition and prestige) in addition to salaries, pensions and other pecuniary incentives.[35] But a striking feature of education systems everywhere – in contrast to most other sectors of the economy -- is that salaries are rarely linked to individual results. The wage scale for teachers is typically much more compressed than in other sectors and salary increases are almost exclusively determined by seniority and formal credentials. This is all the more striking

[35] Vegas, E. *et al.* Incentives to Improve Teaching: Lessons from Latin America (2005)

given the global evidence that neither seniority nor credentials are good predictors of teacher's effectiveness *and* that individual teachers' ability to produce educational results actually does vary widely.

There is less consistent evidence across countries as to what average level of teacher salaries is needed to attract high capacity individuals into teaching over other professions. The average teacher salary in basic education across the OECD is about 1.2 times GDP per capita, adjusted for purchasing power parity. But PISA data show no clear correlation between average salary levels (relative to national per capita GDP) and education system learning performance. Korea and Japan pay above the average, while Finland and Norway pay below. But there is remarkable concurrence in the research literature that the widespread pattern of relatively flat salary progression over teachers' careers plus promotion policies rigidly linked to formal credentials or seniority combine to create weak incentives for teachers to perform.36

To address this, school systems are increasingly experimenting with "pay for performance" programs that award teachers an annual bonus based on their relative performance. Several US school districts, Chile, India and other countries are implementing programs of this type.[37] But Brazil is currently one of the world's most important venues for pay for performance reforms in education, for several reasons. First, at least 7 state and municipal systems have launched bonus programs and several are already in the second or third year of implementation. Second, although the programs share common objectives and are all linked to the IDEB performance measures, they have different design features – such as the average bonus size and the way the targets are set – that affect the 'strength' of the incentive. Third, and most important, because of the unique opportunity to generate global knowledge from the ongoing Brazilian experience, several leading states are collaborating with international researchers to study these design differences in a systematic way. The impact evaluations under way in Pernambuco, São Paulo, Minas, and Rio de Janeiro municipality currently represent the deepest and most extensive comparative research program on this topic in the world.

While all four programs award annual bonuses to teachers (and all other school personnel) based on the school's performance against annual targets, the rules for setting the targets are most conducive to rigorous evaluation in Pernambuco and in Rio de Janeiro municipality.[38] With slight variations across the cases related to the evaluation methods that are possible, the researchers are analyzing how the introduction of bonus pay affects: i) school outcomes (student

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[36] Umansky, Ilana in Vegas et al, Incentives to Improve Teaching, p. 32 (Ballou and Podgursky, 2002; Delannoy and Sedlacek, 2001; Odden and Kelley 1997) . OECD 2010 Education at a Glance reports that on average across all OECD countries, teacher salaries at the top of the scale are only 70% higher than starting salaries. Korea is on outlier with top salaries more than 250% higher than starting salaries.

[37] See Bruns, Filmer and Patrinos for a review of the latest global experience and evidence with teacher incentives reforms.

[38] In the case of Minas Gerais, school targets are set through negotiations between regional administrators and individual schools. In the case of São Paulo, the bonus is structured as a continuous function of schools' achievement of their targets, eg, if a school achieves 1% of its target, personnel receive 1% of their monthly wage as a bonus; for achieving 60% of the target, the bonus is 60% of a month's wage, etc. In Pernambuco, the rules for setting the targets -- based on whether schools fell in the bottom 25%, 26-50%, 51-75% or 76-100% of the performance distribution – created "discontinuities" in the targets that permit rigorous evaluation of their effects. Two schools will have more or less ambitious targets depending on which side of these cutoffs they happen to fall.

learning and progression rates as measured by IDEB); ii) teacher effort, attitudes and teamwork/social capital within the school; iii) possible adverse behaviors (cheating, teaching to the test, diversion of school time from non-tested to tested subjects and grades); iv) schools' strategies for improvement; and v) parents' ability to hold school directors accountable for results (in Pernambuco school directors are elected by the community). Of the four cases, the evaluation in Pernambuco is the most advanced, so initial results from that case are shared here.

Pernambuco's teacher bonus program. In 2008, Pernambuco launched a highly innovative "pay for performance" system that rewards school personnel for achieving their annual school improvement targets. All schools that achieve at least 50% of their targets receive a proportional bonus, up to a cap of 100%; for example, if they achieve 60% of their targets, each member of the school staff (teaching and non-teaching) receives 60% of the average bonus (pro-rated for his or her salary level) in additional pay. Since the state budgets one month's education payroll for the program annually, the average bonus will exceed one month's salary if less than 100% of schools achieve it. In the first year of the program, 52% of schools achieved their targets and the awards averaged 1.8 months of salary for most recipients. In year two, 79% of schools received the bonus and the average award was 1.4 months of salary. This is a large incentive, compared with other programs internationally. Pernambuco's rule that schools achieving less than 50% of their targets receive nothing was also a strong incentive. In São Paulo, by comparison, every school receives some bonus; a school achieving only 3% of its targets receives a 3% bonus.

The "strength" of the incentives embedded in the Pernambuco design make it an important case to analyze. The research is still ongoing, so results reported here are preliminary, but key findings thus far are the following:[39]

- **Acceptance of the bonus program was relatively high**. Sixty-four percent of school directors surveyed in the first year of the program believed the policy is an appropriate one and 66% reported that the bonus program was having a positive impact on their school – whether or not they received the bonus.

- **Schools with more ambitious targets achieved more progress (all other things equal).** In almost every performance category (4th, 8th or 11th grade, math or Portuguese), schools falling on the "higher target" side of the performance cutoffs made larger test score gains than the comparison schools just below the cutoffs. The differential learning gains were sharpest for schools just above the 25th percentile of performance. For the 8th grade in 2008, for example, schools on the "higher target" side of the cutoff improved average test scores in Portuguese by 31% of a standard deviation more than the schools just below the cutoff (with less ambitious targets). In math the performance differential was 15% of a standard deviation. At the second cutoff (just above and just below the 50th percentile in the performance distribution), improvements were also higher for the schools with more ambitious targets, but of smaller magnitude. For the other tested grades, 4th and 11th, impacts were in similar ranges, but varied across subjects and in a few cases, by cutoff point. Overall, however, the evidence was

[39] Ferraz and Bruns (2011, forthcoming): "Incentives to Teach: the effects of performance pay in Brazilian schools"

consistent – at least over the very short term – that higher targets in the presence of an attractive incentive in Pernambuco induced higher learning results by schools.[40]

- **Learning levels across the state improved significantly.** Pernambuco's state schools as a whole registered significant average learning improvements, especially in Portuguese. Average Portuguese scores in 8th and 11th grade increased from 2008 to 2009 by 44% and 57% of one standard deviation (SD), respectively. Math scores in 8th and 11th grade rose by 27% and 31% of one SD. These learning gains are very large, relative to observed results from other teacher incentive programs. However, since this was a universally applied program within the state, these are raw gains, and not gains relative to a comparison group. Difference-in-differences analysis will be needed to bound these gains. As Pernambuco ranked quite low in national IDEB rankings in the prior year (2007) some of these gains likely reflect a natural tendency of unusually low or high scores to revert to the mean.

- **Schools that just missed receiving the bonus in 2008 appeared to improve more than schools that barely achieved the bonus in 2008.** A key research question is whether schools that received the bonus in 2008 would be more motivated in 2009 -- or exert less effort and coast. To examine this, the performance of schools that fell just short of 50% of their 2008 targets (and did not receive the bonus) was compared with the performance of schools that achieved just over 50% of their targets and did get the bonus. Controlling for schools' 2008 test results and other school characteristics, schools that barely missed the bonus in 2008 improved more than schools that barely achieved the bonus in 2008. It appears that – at least for schools that came fairly close in 2008 -- not getting the bonus had a positive effect on schools' motivation and performance.

- **Schools whose teachers spent more time on instruction were much more likely to achieve the bonus**. Classroom observations carried out in November 2009, just before the end-of-year student achievement exams, showed significant disparities in how efficiently teachers used classroom time for instruction. (Table 15) These differences – and differences in the share of time teachers were off-task or absent from the classroom – were highly correlated with schools' likelihood of achieving the 2009 bonus (paid in 2010 based on year end-performance in 2009).

[40] A different model used to instrument the targets for the discontinuities also showed evidence that higher targets – ceteris paribus -- lead to higher school-level learning results, over the short term.

Table 12: Classroom dynamics in 220 Pernambuco schools November 2009

Teacher Use of Instructional Time	OECD Good Practice Benchmarks	Overall PE sample	Subsequently achieved bonus for 2009	Didn't achieve bonus for 2009	Difference, bonus and non-bonus recipient schools
Learning Activities	85%	61%	62%	53%	0.09 (0.04)**
Classroom management	15%	28%	27%	30%	-0.03 (0.03)
Teacher off-task	0%	12%	10%	17%	-0.04 (0.02)***
…o/w teacher out of classroom		8%	8%	12%	-0.04(0.02)***

Note: Standard errors in parentheses.
* significant at 10% level; ** significant at the 5% level; *** significant at the 1% level.
Source: Bruns, Cruz and Amorim (forthcoming, 2011)

The joint team of Pernambuco and international researchers is currently exploring the in-school factors that may explain consistent success as well as how the targets and bonus payments interact to induce school improvement. The periodic research observation of over 1800 classrooms in almost 300 schools is shedding new light on why some schools perform better than others and *how* incentives affect school actors. In theory, if an incentive *causes* an improvement in student learning, it should operate through changes in teacher behavior that are induced by the incentive, such as increased or more effective teaching effort. It will be interesting to see how these patterns evolve over time after schools have received the "information shock" and incentive of either achieving or not achieving the bonus during 2010.

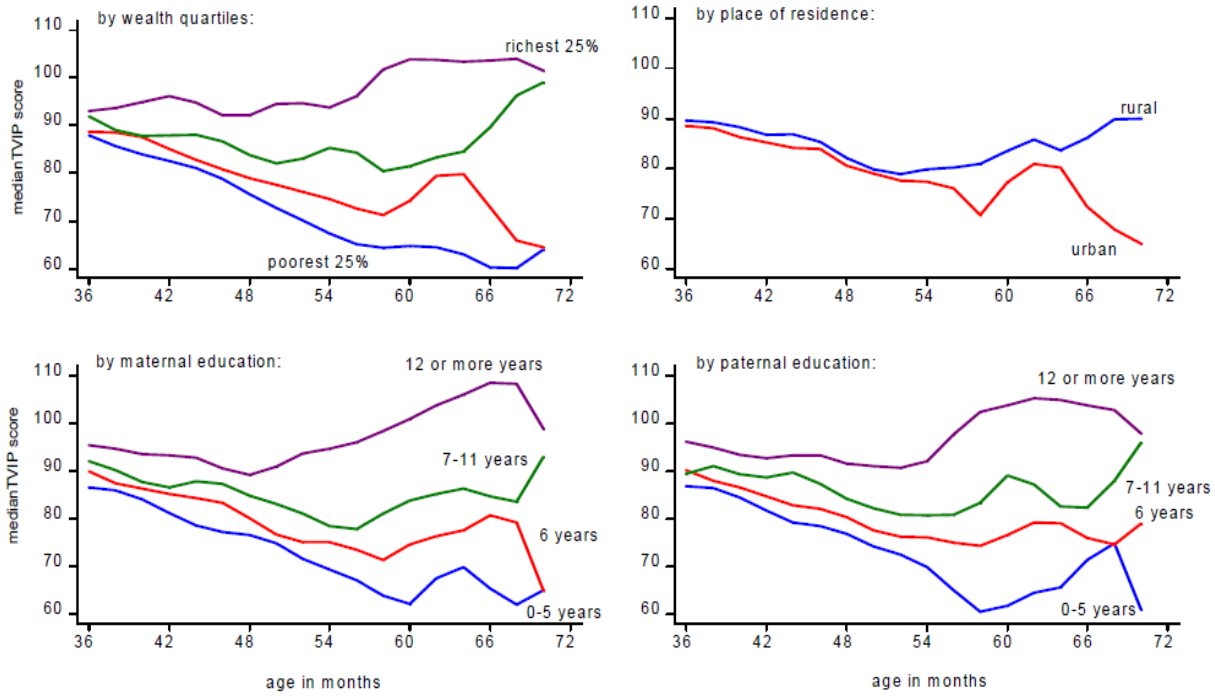
The evaluation of Pernambuco's pay for performance program is expected to continue for several more years, permitting much deeper analysis of how annual targets and past rewards affect schools' improvement strategies, teacher behaviors, and overall system progress. Its results will also be directly comparable with the new program in the municipality of Rio de Janeiro, which also sets targets for improvements in IDEB outcomes as the basis for the bonus, and which also has established performance targets around several different thresholds. The Rio program design is additionally interesting because it embodies strong sanctions against teacher absence: only employees with five or fewer absences for the school year (whether excused or unexcused) receive the bonus. In 2010, 290 of Rio de Janeiro's 1,044 municipal schools qualified for the bonus based on their 2009 IDEB improvements, but more than one-fourth of these schools' 11,000 employees did not meet the bar for individual attendance. Rio de Janeiro municipality's program is currently the strongest effort to attack endemic absenteeism in Brazilian schools. It will be important to measure how the bonus program's incentives affect absence rates over time.

As in Pernambuco, a large sample of Rio de Janeiro municipal schools is being followed in a panel study that includes systematic classroom observation using standardized protocols. Although the evaluations of the Minas Gerais and São Paulo bonus programs cannot exploit the same research methods, similar data is being collected and will enrich the comparative analysis. A set of dynamic education secretaries in Brazil, pursuing innovative policies and willing to subject them to research scrutiny, are currently pushing the frontier of global knowledge on pay for performance in education.

B. Strengthening Early Child Education

Children with identical cognitive performance at age 3 can develop huge advantages or delays in development depending on the wealth, residence, or educational level of their families. These disparities in the cognitive potential and skills of children from advantaged and disadvantaged backgrounds become more acute over time, as demonstrated by cognitive development measured by a vocabulary test, the *Test de Vocabulario en Imágenes Peabody*, or TVIP (see Figure 29).

Figure 29: Cognitive Development of Children Age 36-72 Months in Ecuador



Source: Schady, N. "Early Childhood Development in Latin America and the Caribbean," " Economía 6(2), Spring 2006, pp 185-225.

Early child development programs have powerful potential to compensate for inequalities in income and social background. In the absence of early child interventions, disparities in the cognitive potential and skills of children from advantaged and disadvantaged backgrounds become more acute over time.

Evidence from the United States suggests that high-quality early child development programs have significant impacts on cognitive ability, earnings, and social behaviors. Across a range of programs, education impacts are clear and consistent. Grade retention is reduced between 13% and 47%, the likelihood of secondary school dropout is reduced between 24% and 32%, and at least some programs show increase college participation. Beyond education to the life outcomes that matter most, a variety of programs demonstrated social impacts, significantly reducing

involvement in crime, adolescent pregnancy, and drug problems, and significantly augmenting earnings potential.[41]

Not only do the returns to these programs tend to dramatically overshadow returns from programs for older children, suggesting that expanding investment in early child education is wise; the impacts of grade progression suggest that the impacts are complementary, making later education investments even more effective. Early child education strengthens the quality of the entire system.

Only significant improvements in both access and quality can level the playing field. Whether early child education can level the playing field depends on the access that disadvantaged children have and whether ECD has differential impacts for them. Because many studies have focused on the poorest, there is limited evidence on the relative impact across income groups. However, two studies in the United States demonstrate larger cognitive effects for disadvantaged children. Some evidence from international studies (Ecuador, Mauritius, Vietnam) suggests the same.[42] Further, because disadvantaged children are particularly at risk for adverse social outcomes (e.g., involvement in crime and adolescent pregnancy), impacts are likely to be significantly higher for them.[43] However, simulations suggest that only large improvements in both access and quality for the most disadvantaged can significantly close the gaps in school readiness.[44]

The programs with strongest positive evidence are high-quality programs reaching vulnerable populations. Not all early child education programs are equal, and the clearest evidence comes from well targeted programs. For example, the Perry Pre-school Program in the United States included (for three- and four-year-old children), a 2.5-hour pre-school program on weekdays as well as weekly home visits by teachers. In addition, the program had a clear, active learning curriculum wherein children planned, carried out, and reflected on their activities.[45] The Abecedarian program, also in the United States, offered full-day child care (up to 10 hours) for children from three months of age up until school entry, also with a clear learning curriculum (i.e., not merely child care).[46]

Alternatively, larger scale programs show significantly more mixed results. The expansion of public daycare provision for children age 0 to 4 years old in Quebec, Canada, demonstrated small adverse effects on children's social behavior and health. In Denmark, universal provision of public pre-school for children age three had no clear impact for children's cognitive or behavioral development. In Argentina, a large expansion of public pre-school (age 3-5) had

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[41] Barnett, W. S., & Belfield, C. R. (2006). Early childhood development and social mobility. The Future of Children, 16(2), 73–98. Tables 1 & 2.
[42] Nores, M., & Barnett, W. S. (2010). Benefits of early childhood interventions across the world: (Under) Investing in the very young. Economics of Education Review, 29(2), 271-282.
[43] Barnett, W. S., & Belfield, C. R. (2006). Early childhood development and social mobility. The Future of Children, 16(2), 73–98.
[44] Magnuson, K. A., & Waldfogel, J. (2005). Early Childhood Care and Education: Effects on Ethnic and Racial Gaps in School Readiness. The Future of Children, 15(1), 169-96.
[45] Heckman, JJ, Moon SH, Pinto R, Savalyev PA, Yavitz A. (2010). The rate of return to the HighScope Perry Preschool Program. Journal of Public Economics, 94(1-2), 114-128.
[46] Barnett, WS, Masse LN. (2007). Comparative benefit–cost analysis of the Abecedarian program and its policy implications. Economics of Education Review, 26(1), 113-125.

positive impacts on both test scores and behavior. From this array of evidence, what stands out is that while universal programs may not have unambiguous impacts, programs focused on the most vulnerable children can have unambiguously positive impacts.

Various studies in Brazil have examined the impact of early child education, but in most of these studies, it is difficult to completely separate the impact of early child education from other differences. One World Bank study examines outcomes for Brazilian adults who attended pre-school between 1937 and 1976, finding positive impacts on total educational attainment and grade progression.[47] A more recent study, examining students in one municipality in São Paulo state on the Provinha Brasil in 2008, found students who had attended pre-school or crèche had 6% higher literacy scores.[48]

Potential improvements in access. In recent years, Brazil has made great strides in expanding access to early child education, both at the pre-school level (age 4-6) and at the crèche level (age 0-3), as demonstrated in Table 16. Furthermore, early child education has been institutionalized both through the 1988 constitution recognizing early child education as the right of every child, the 1996 formalizing of responsibility for early child education under the Ministry of Education, and the 2010 law making schooling obligatory from age six (relative to age seven previously).

Table 13: Improvements in Access to Early Child Education in Brazil, 1996-2009

	% enrollment	
	1996	*2009*
Crèche	8%	18%
Pre-school	49%	81%

While these improvements in policy and expansions in coverage are positive moves, the children who need these benefits the most remain the least likely to benefit from them. Pre-school participation for the poorest quintile of the population lags behind that of the richest quintile by almost 20% (75% for the poor, 94% for the rich), and crèche participation for the poorest is barely one third of that for the richest (12% for the poor, 35% for the rich).

These wealth distinctions largely overlap with the urban-rural gap, which is even more striking: In 2009, under 9% of rural children were enrolled in crèches, whereas over 20% of urban children were enrolled. When examined together, poverty and living in rural areas each separately reduces a child's chances to participation in early child education.[49]

Improving access for the very poorest. Providing access to early child education for the very poorest children, especially in rural areas, means supporting creative solutions to the challenge of large distances and sparse population. Providing centers and transport for the youngest children in rural areas may be neither effective nor viable from a budget perspective.

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[47] World Bank (2001). "Brazil Early Childhood Development: A Focus on the Impact of Preschools." Human Development Department, Brazil Country Management Unit, Latin America and the Caribbean Region, Report No. 22841-BR.
[48] Felício F, Menezes RT, Zoghbi AC. (2009). The Effects Of Early Child Education On Literacy Scores Using Data From A New Brazilian Assessment Tool. Manuscript.
[49] Evans, D. and Katrina Kosek. 2011 (forthcoming) "Access to Early Childhood Education in Brazil" World Bank.

Two states have embraced home-based models as the most viable ways to provide effective services in a rural setting. Both models support early child development, although one is housed in the Education Secretariat while the other is housed in the Health Secretariat. The example in education is Acre's *Asinhas da Florestania* program. Because children age four and five cannot be expected to travel several miles to a school, the state has developed a program to fill the gap as the municipalities develop their own capacity. The program uses a strategy of home-based visits to support children's social, psycho-motor and cognitive development. Education agents trained by the State Secretariat of Education, usually high school graduates from the same municipality as the children, visit the homes of the children in rural areas twice a week. The agents usually select one house in the community and receive all the children in the neighborhood. While activities are targeted towards children of pre-school age, younger siblings are invited to participate in the activities.

Financing is shared between the state and the municipalities, wherein the municipalities pay for their agents and supervisors and the State Education Secretariat provides training, didactic materials and technical support. Usually they select one house in the community, which will receive all children from the neighborhood. The communities are very isolated, very small and have, on average, five families and around five to seven children. The program, just launched in 2009, currently serves about 1,700 children.

The example in health is Rio Grande do Sul's *Primeira Infância Melhor* (PIM) program, which was in turn inspired by Cuba's *Educa a Tu Hijo* program. The program focuses on children age 0 to 6 in areas with high social vulnerability and a lack of early child care and education facilities. For children from birth through age two years and eleven months, the program adopts an individual care approach. Children and caregivers are visited for one hour each week by a Home Visitor, during which the Home Visitor first explains the planned stimulation activity to the caregiver, then helps the caregiver to carry out the activity, and finally discusses the child's development as observed in the activity and clarifies doubts. Families are provided with materials to help them continue the activities during the week. For children age three to six, the children and their caregivers meet in a pre-existing public space (e.g., a town hall, a playground, or a spacious room in one of the participating child's home) once a week and carry out a similar agenda as in the home visits.[50] The program, launched in 2003, currently reaches over 85,000 children.

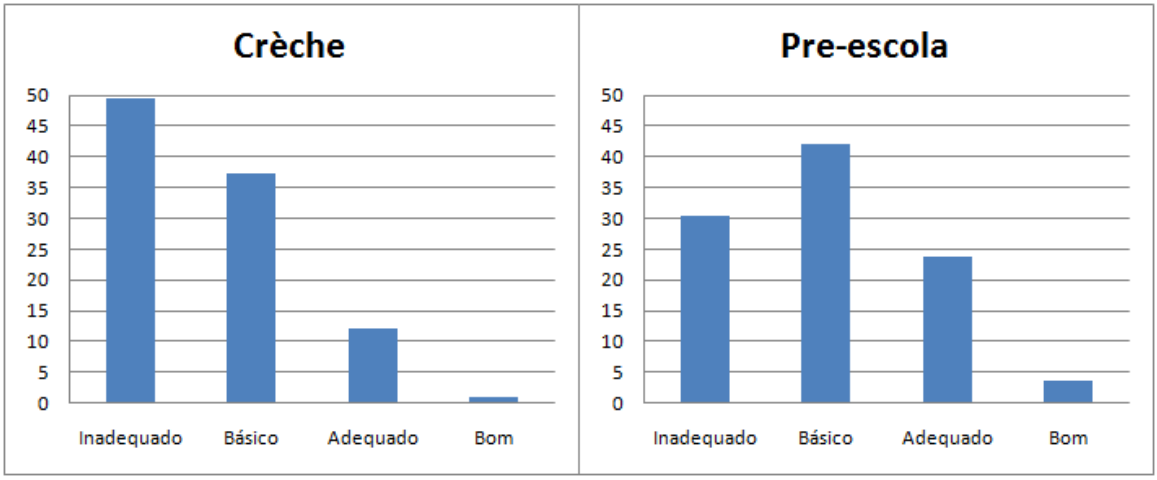
As in the cases above, states and municipalities can partner to invest in creative programs that reach children in difficult-to-reach areas. Likewise, the Ministry of Education can encourage states and municipalities to explore alternatives to simple center-based care in settings where constructing dedicated centers may not make fiscal or developmental sense, instead taking advantage of homes and pre-existing structures to offer stimulation for all of Brazil's vulnerable children.

Potential improvements in quality. Simply providing a place for children to receive care does not inherently result in any cognitive development. Quality of care is paramount, and this is the likely cause for mixed results on many large-scale early child development interventions. Even

[50] Schneider A, and Ramires VR. 2007. *Primeira Infância Melhor: Uma Inovação em Política Pública*. UNICEF: Brasília.

as Brazil expands access to help the poorest to receive cognitive and social stimulation, steps must be taken to ensure that quality improves. A recent study carried out by Fundação Carlos Chagas in six state capitals around Brazil (Belém, Campo Grande, Florianópolis, Fortaleza, Rio de Janeiro, and Teresinha) carefully examined the quality of pre-primary institutions in 18 to 30 institutions per state using adaptations of two internationally established instruments, the Infant/Toddler Environment Rating Scale – Revised (or ITERS-R) for crèches and the Early Childhood Environment Rating Scale – Revised (or ECERS-R) for pre-school. These instruments measure quality across a broad range of characteristics including personal care, activities, interaction, space and equipment, program structure, teaching speaking and comprehension, and the faculty and parent involvement.[51] Taking all these areas together, 50% of crèches surveyed were judged to be "Inadequate" according to a standardized international scale, whereas just 1% of crèches were judged to be "Good."[52] (Figure 30) At the pre-school level, quality was slightly better, with 30% of pre-schools found to be Inadequate and 4% found to be Good. While the Brazilian adaptation involved a shift in scale, making comparisons imperfect, a recent study in 692 American pre-schools placed the average American pre-school squarely in the "Adequate" range, as did a study of pre-schools in Germany and in Portugal.[53] The Brazilian preschools are even lower in quality, and crèches are even more likely to be inadequate.

Figure 29: Distribution of crèches and pre-schools, by quality



Source: Campos MM et al., "Educação Infantil no Brasil: Avaliação Qualitativa e Quantitativa," Fundação Carlos Chagas, 2010.

These numbers indicate major room for improvements. At both levels of education, the very weakest areas were activities for the children (including the provision of blocks for play, music and movement activities, and activities demonstrating nature and science principles, among

[51] Campos MM et al., "Educação Infantil no Brasil: Avaliação Qualitativa e Quantitativa," Fundação Carlos Chagas, 2010.
[52] For crèches, the instrument used was the Infant/Toddler Environment Rating Scale, Revised Edition (ITERS-R) and for pre-schools, the Early Childhood Environment Rating Scale, Revised Edition (ECERS-R) was used.
[53] LoCasale J et al. 2007. Tietze W et al. 1998. The 1998 study uses ECERS and 2007 study uses ECERS-R. Sakai et al 2003 demonstrates comparability of the instruments.

others) and program structure. Alternatively, interactions between staff and children rated high. In other words, staff want to work with the children, but lack the skills to do so in a way that effectively stimulates child cognitive and social development.

Evidence from Rio de Janeiro shows significant disparities in quality across crèches (as well as the overall need for improvement). Using a similar measure of crèche quality to that described above, the bottom 20% of crèches in Rio de Janeiro had a level of quality roughly half that of the top 20% of crèches. Furthermore, comparing the relative cost of these levels of care, the high-quality centers cost 79% more to run per child than the low-quality centers.[54]

How to improve quality. Three key areas determine the quality of early child education programs: curriculum, training and supervision, and ongoing monitoring and evaluation. In each of these areas, there is a role for the Ministry of Education in providing guidelines, materials and oversight. But core responsibilities rest with the municipalities that implement programs.

- *Curriculum*

In the examples of high-return early child education programs such as Perry Preschool and the Abecedarian program, each program had a high-quality curriculum that guided the activities of caregivers and children. A randomized trial comparing three curricular models for three and four-year-olds demonstrated far better long-term outcomes for children with curricula in which children initiated activities and teachers than responded or in which teachers and children planned activities together, as compared to a more scripted curriculum.[55] Many municipalities in Brazil lack any curriculum for early child education, and almost all lack a curriculum for crèche care. A crèche-level curriculum should be different from that for pre-school, not seeking to transform crèches into small schools, but rather providing caregivers with clear instruction on how to introduce and work with children to develop activities that will stimulate children's social and cognitive development. The Basic Education Secretariat in the Ministry of Education already provides a range of publications to guide crèches, including a three-volume curricular reference guide published in 1998. A natural extension to that reference would be practical guide to daily stimulation activities which municipalities then adapt to their needs.

- *Training & Supervision*

The overwhelming body of evidence suggests that higher levels of education are not the key requisites for an effective early childhood educator. Rather, it appears to be individuals' ability to focus on a child's needs, facilitate child-centered activities, and believe that each child can grow and succeed, etc. that makes them effective caregivers or ECD teachers. Evidence from the United States demonstrates a clear relationship between creative play activities facilitated by teachers, positive social interaction with teachers, and enhanced cognitive performance in early child education. Evidence from Bermuda suggests that educators with more training specifically

[54] Barros R, Carvalho M, Franco S, Mendonça R, and Rosalém A. (2010) A short-term cost-effectiveness evaluation of better quality daycare centers. IPEA.

[55] Schweinhart LJ, and Weikart DP. (1998) Why curriculum matters in early childhood education. Educational Leadership, 55(2), 57–60.

in early child education have more of these positive social interactions.[56,57] A review of training systems for early child education workers demonstrates that all require significant proportions of the staff to have specialized training; see Table 17 below. Brazil's Ministry of Education can encourage municipalities to employ higher proportions of caregivers with specific training in early child education as well as to take advantage of MEC's Proinfantil, which provides distance training to teachers in crèches and pre-schools. Further, these principles must be a part of pre-service training as well as in-service training programs.

Table 14: Early child education center training around the world (2000)

Country	*Proportion ECE trained*	*Duration of ECE training*
Denmark	Two-thirds	3.5 years
France	Age 0-2: At least half	1 year
	Age 3-6: Almost all	5 years
Sweden	Pre-school teachers – 60%	3 years
	Childcare assistants – 35%	3 years

Source: Moss P. (2000) Training of early childhood education and care staff. International Journal of Education Research. 33:31 53.

In addition, in order for teachers to successfully apply these principles, supervision that includes regular in-class observation by experts, coupled with real-time feedback, is essential. Just as more and more education secretariats are adopting direct, systematic classroom observation as a form of monitoring and improving primary education, the same systems (albeit with distinct instruments) are needed for early child education. Adaptation of early child education observation instruments (such as the Early Childhood Classroom Observation Measure, which focuses on teacher practices, and the Early Childhood Environment Rating Scale, which focuses on classroom environment and activities) and support in their implementation could be played by the Ministry of Education, together with the adaptation of these systems by municipalities charged with providing early child education.

- *Monitoring & Evaluation systems*

No system is perfect, and the best programs regularly evaluate what is working and what is not, and update accordingly. In these programs, evaluation is not merely a tool to confirm foregone conclusions but rather an instrument for continual reshaping. They evaluate programs in real time to make adjustments, as well as programming rigorous evaluation to measure the effectiveness of ongoing programs.

An excellent example of this is the Municipality of Rio de Janeiro. In the face of massive excess demand and limited supply for crèche vacancies, the Education Secretariat introduced a new program, *Primeira Infância Completa*, in November 2009, which offered Saturday child care and parenting classes to households on the waiting list for weekday crèche care. Despite an initially strong reception, broad interest in the program waned, as many parents decided that this

[56] Howes, CH, and Smith EW. (1995) Relations among child care quality, teacher behavior, children's play activities, emotional security, and cognitive activity in child care. Early Childhood Research Quarterly 10:381-404.
[57] Arnett, J. (1989) Caregivers in day-care centers: Does training matter? Journal of Applied Developmental Psychology 10(4), 541-552.

particular set of services did not meet their needs: The trouble of bringing their children to the crèches and participating in the parenting classes did not merit the one weekend day of care provided. In response to real time monitoring of response, the Education Secretariat decided to close down the program in its current form and instead develop an alternative program providing parenting classes for the most vulnerable households, those benefitting from Bolsa Família, with a small stipend attached to further benefit household consumption. This willingness to rethink programs that are not effective and to experiment with new programs is essential.

Likewise, the Municipality of Rio de Janeiro has put systems into place for rigorous evaluation of programs. With the massive excess demand, the Municipality implemented a lottery to allow all interested children the possibility of participating in crèches while giving greatest chances to the most vulnerable children. This lottery, implemented in order to fairly distribute limited crèche vacancies, has permitted the comparison of directly comparable children participating in crèches with those who are currently on the waiting list for crèche care. This system will permit the first rigorous evaluation of the impact of crèche care in Brazil and one of the first in all of Latin America.

C. Schooling a 21st century workforce: raising quality in secondary education

Perhaps no segment of the Brazilian education system crystallizes the quality gap with OECD countries as clearly as secondary school. Despite high enrollments, the share of youths that completes secondary school in Brazil remains barely 60% (compared with 80% across the OECD). In the US, there is concern about the 12% of high schools that have over 40% dropout rates. Using the same benchmark in Brazil, 40% of all state secondary schools are "dropout factories." In 5 states, over ***50% of state-run secondary schools*** have this abysmal level of performance. (Annex Table 6.16). Perhaps even more extraordinary than these dropout rates is the high share of Brazilian students who do ***not*** drop out, but spend years pursuing a secondary school degree despite recurrent repetition and the high opportunity costs of remaining in secondary school into adulthood. An estimated 44% of Brazilian secondary school students are at least two years over-age for their grade. And fully 15% of all secondary graduates are over age 25 – 7 years behind the official graduation age.[58] Nothing like these patterns is observed in other LAC countries, other middle-income countries, or OECD countries.

Visit a Brazilian secondary school today and in many cases you are entering a school at night. (Table 15) While Korean and Finnish students have an 8 hour school day beginning at 7 am in buildings replete with labs, laptops, libraries and performing arts facilities, the Brazilian school will run from 6 to 10 pm in a primary school building, without even desks adequate for teen-aged bodies. Support facilities are rudimentary at best; walls are filled with graffiti; uneven lighting punctuates the halls. Teachers, hurrying from their day jobs, may arrive late and may be, like many of the students, exhausted.

Over the past 20 years, Brazil's massive expansion of coverage has created a new and badly-resourced third "leg" of the secondary education system, which earlier consisted of a tier of high quality, university-preparatory gymnasiums for the elite and an "S" system (SENAI, SENAC,

[58] OECD 2010 Education at a Glance

SENAR) of vocationally-oriented schooling for the lower-middle classes.[59] State secretaries of education across Brazil are working hard to raise quality, but achieving world class education at the secondary level in Brazil will be a challenge for the next decade. Major infrastructure investments will be needed to support a longer school day and eliminate evening instruction for all students. The curriculum, which Schwartzman notes is "overloaded with a large number of mandatory courses (including sociology and philosophy in addition to mathematics, physics, chemistry, biology, Portuguese, English and Spanish among others)" is impossible to cover effectively in the limited instructional time.[60] Delivering the advanced math and science instruction that OECD countries are emphasizing is complicated in Brazil by severe shortages of qualified science and math teachers. Virtually every state system currently relies on under-qualified temporary teachers to fill these vacancies. And the low content mastery that characterizes Brazilian teachers more generally presents especially acute constraints on academic quality at the secondary level.

Table 15: Share of enrollments at Night and IDEB - State schools – 2009

State	Share of enrollments at night	IDEB
Over 50 percent		
Piauí	57%	2.7
Amazonas	51%	3.2
Pernambuco	51%	3.0
Maranhão	51%	3.0
Sergipe	51%	2.9
Below 35 percent		
Rio Grande do Sul	34%	3.6
Rondônia	34%	3.7
Espírito Santo	30%	3.4
Acre	24%	3.5
Roraima	21%	3.5
Distrito Federal	17%	3.2
Brasil	42%	3.4

Source: INEP Censo Escolar 2005, 2007 and 2009
Note: Night Shift classes defined by INEP as starting at 5pm or later. All data are for students in Ensino Médio in State (Estadual) systems

Innovative reforms and good practice approaches are spreading, however. Some states have achieved big drops in the share of students in night classes over the past 5 years. While for Brazil as a whole, the share of secondary students enrolled at night (in state schools) fell from 49% to 42% between 2005 and 2009, in Tocantins, they shrank from 61% to 36% -- while the

[59] Simon Schwartzman, "Benchmarking Secondary Education in Brazil" May 2010, IETS (*Instituto de Estudos do Trabalho e Sociedade*)

[60] *Ibid.*

state's IDEB rose from 2.9 to 3.3. Starting from a much more favorable position, the Distrito Federal also achieved a large percentage point reduction in the share of enrollments at night -- from 32% to 17%, and also saw an increase in IDEB. Paraiba, Minas and Mato Grosso also made substantial progress. Parana, which scored highest in the country on the 2009 IDEB for secondary education, has developed an impressive program called *"Escola Pública Integrada"* (EPI). Launched in 2003, EPI program provides not only full day education, but a broad curriculum including sports, arts and culture, among others.

While Table 15 does not show a perfect correlation between states' secondary school IDEB performance and either the current level of night shift enrollments or trends over the past 5 years, this is likely because daytime shifts do not always represent longer hours of instruction. Few secretaries of education believe they can achieve world class secondary schools without achieving full day instruction. A comparison with the highly regarded federal technical schools and private secondary schools drives this home. (Table 16) Although the selectivity of both the federal technical schools and private secondary schools clearly plays a role in their superior learning results, it is no coincidence that these schools also function with longer hours of instruction and almost exclusively by day.

Table 16: Distribution of secondary enrollments by type of school and shift, and PISA Math Performance, 2009

	Morning	Afternoon	Night	PISA Math
School system				
State	42%	16%	42%	**372**
Federal	78%	20%	2%	**521**
Private	88%	8%	4%	**486**
Brazil	**48%**	**15%**	**37%**	**386**

Source: INEP Censo Escolar 2009, OECD PISA database, 2009
Note: Morning shift classes start between 6 and 11am. Afternoon shifts start at 12m and end at 17pm. Night shifts start at 18pm or later.

Over the next decade, Brazil's demographic transition will put wind in the sails of a move to full day secondary schooling. The number of secondary students currently attending night school (3.2 million) is substantially smaller than the projected 7 million student decline in the primary school population before 2020. This will generate major opportunities to reconfigure primary school infrastructure to create full-day secondary schools. Progress in reducing repetition and age-grade distortion could also have a huge impact. Brazil already has a gross enrollment ratio in secondary education of over 100 percent – which means it currently has enough school places for all of the official age group, even though less than 75 percent of all children attend secondary school and only 60 percent of children complete it. The difference is enrollments swollen with repeaters. As states' strategies for reducing age-grade distortion and improving overall quality begin to make headway, the infrastructure challenges at the secondary level will ease further.

But large investments in the quality of school infrastructure will clearly be required. The typical Brazilian secondary school today is hugely under-resourced, against any global comparator. The federal government is investing significantly to expand its network of technical schools. States

are developing creative strategies to partner with private corporations in creating demonstration schools, discussed further below. But the federal technical schools are still only 182 of Brazil's 22,666 secondary schools, and full-day schools at the state level do not exceed 10% of total secondary enrollments.

A number of states are working hard on more comprehensive strategies. And some, such as Minas Gerais, are developing important new approaches to a key issue for secondary education – the balance between academic and vocational content. Although none of the experiences we describe below has been rigorously evaluated, they represent promising directions, which can loosely be grouped as:

- System-wide strategies for improving secondary education
- Demonstration schools
- New models of technical/vocational education

1. System-wide improvement strategies

São Paulo's curriculum and training reforms. The state of São Paulo is a good example of a comprehensive approach pursued with sustained political commitment. The state, which has seen its IDEB at the secondary level increase from 3.3 to 3.6 since 2005, has registered even stronger results at the primary level, which should translate into further secondary education improvement in the coming years. The core of the strategy is systematic attention to fundamentals.

First, the state's major reform of the curriculum in 2007 set clear learning standards for each grade and subject (at the primary as well as secondary level) and launched the development of high quality learning materials for students and teachers. This has been the anchor for other reforms at the secondary as well as primary levels. It is impossible to have instructional quality without clarity about what is important to teach. International curriculum specialists who have reviewed the state's *Ler e Escrever* and *São Paulo Faz Escola* materials rate them highly.

Second, São Paulo in the mid-1990s was the first state to attack the problem of high repetition and age-grade distortion through "accelerated learning" programs. Although repetition rates have declined, in part through teacher development courses focused on breaking the cultural norm that excellent teaching means high rates of student failure, the state continues to offer well-designed, targeted programs aimed at students who have fallen behind.

Third, for over a decade, the state has emphasized the construction of full-day secondary schools and has reduced the share of secondary students in night schools from close to 70% in 1995 to 44% in 2009. Although there is still a long way to go, the current administration has transformed an additional 500 schools into full day schools.

Fourth, from 2008-2010, innovative reforms discussed earlier – the introduction of teacher pay for performance and tests of teacher content mastery -- have created incentives for school improvement and a higher threshold for teacher quality across the system.

Fifth, in 2010, the state launched a partnership with 3 state universities to develop a wholly new approach to in-service training for secondary school teachers, called REDEFOR. The new

training is aligned to the curriculum and focused on effective teaching practices, including efficient use of instructional time and full use of the state's learning materials. The one year course, being delivered through the state's 91 distance learning sites to 30,000 teachers per year, represents a new model of in-service training that merits careful evaluation. By specifying the training design and establishing a consortium of university providers, the state has assumed much greater direct control of the in-service training content and quality than has been the norm in Brazil.

Finally, the state is clearly fixed on the challenge of building 21st century skills for its students. It has recognized the importance of foreign language instruction but eschewed the slow, traditional model of trying to build up its own stock of language teachers. Instead, it launched an innovative "language voucher" program in 2010, which permits São Paulo state secondary students to take one year of intensive English, Spanish or French instruction at any certified language academy of their choosing. This innovative program capitalizes on the abundance of language institutes, such as Berlitz, that have long catered to private demand in the state. Parental support for the program is tremendous; students may take courses at their own schedule, and the superior quality of the instruction is appreciated. The language voucher is an excellent example of education policy aimed at results for students.

Ceará. Ceará has also implemented a range of strategies to improve secondary school quality. First, although most schools are still on double shifts, the state has established 59 full-day schools since 2008, with 52 more planned. These schools operate from 7:30 am to 5 pm and offer both strong academics and technical/vocational course options. Through a joint program with local industry, graduates are offered six-month internships at a state-subsidized wage. After the internships, graduates may opt to stay in the work force or move to higher education. The Ceará schools offer a good example of what is considered best practice in the OECD – ensuring that students at all points in their education are qualified to move back and forth from the labor force to the formal schooling system. A major issue with vocationally oriented schooling in many parts of the world has been the low academic content that left students un-prepared for further formal education.

Second, the state education secretariat created a program to reduce repetition and dropout in the first year of secondary school, called Learning First. The program is based on a set of learning resources designed to strengthen students' basic math, reading comprehension and problem solving skills. Funded with MEC support, teachers' guides and student workbooks have been created for several different disciplines and supplied to all high schools in Ceará.

Third, the state implemented a campaign to upgrade secondary school infrastructure. The highest priority has been ensuring that all secondary schools have science laboratories and sports facilities.

Fourth, the state has worked to improve the skills and culture of high school teachers, particularly in grade 9. Recognizing that part of the reason for high 9th grade repetition rates was teachers' concern that students lacked the appropriate skills, the secretary of education started working with the teachers to convince them that providing struggling students with focused support would be more effective than failing them. To make this strategy viable, the secretariat developed a special training program to help 9th grade teachers in all disciplines work in a

coordinated way on strengthening students' reading comprehension and vocabulary development. The Secretariat also moved teacher training funding down to the school level so that teaching teams could decide their own priorities and work on these together.

Finally, the state has been more aggressive than most states in not only using IDEB to monitor schools' performance but also to hold principals accountable when performance is poor. For its lowest-performing secondary schools, Ceará has hired new principals and given them a portfolio of data on the schools' past performance. Each school has had to prepare a new improvement plan and submit these to the secretary for approval. Once approved, implementation is monitored by superintendents on a bi-monthly basis. To further stimulate improved performance, the Secretariat has created incentives for the 150 best performing schools to partner with the state's lowest performing schools. The high-performers receive additional funds to support their own school's development plan, but in order to receive the last 33% of their funding, they must work with a low-performing school to help it improve as well. This innovative "twinning" support complements the other resources the state is channeling to under-performing schools, such as additional training, technical assistance and instructional materials.

Minas Gerais. The state of Minas Gerais is also moving on many different fronts to improve the quality of secondary education. One of these – aimed at strengthening technical and vocational training – is discussed in a later section. The state has long been the leader in Brazil in school-based management: school directors are elected by the community; schools have control of their own budgets, and school-level planning is a well-developed function. Minas has complemented autonomy at the school level, however, with an exceptionally effective central administration. The state's central and regional offices provide oversight and support functions, including curriculum standards, learning materials, teacher training, and, since 2007 a teacher bonus program.

A particularly interesting example of the state secretariat's innovative management is the PAAE (*Programa de Avaliação do Aprendizagem Escolar*) 9th grade assessment program, developed in 2008. The PAAE is an ingenious online item bank of test questions developed by teachers themselves (but vetted by SEE test experts) covering all areas of the 9th grade curriculum: arts, biology, physics, geography, history, foreign languages, Portuguese, math and chemistry. Questions are graded by difficulty level and the item bank currently includes over 25,000 items, including 9,462 easy, 11,042 average, and 4,129 difficult items. By logging into the system, a teacher can generate a 2 hour test which measures students' mastery of the curriculum for that area. Online feedback from teachers and students who have used the test is highly positive as to the usefulness of the diagnostic and the quality of the test items.

The PAAE is designed to give confidential, real-time feedback to individual classroom teachers about the learning levels of his/her students at the beginning and the end of the school year. The teacher is also expected to take the test. Since it is applied at the level of individual classrooms for individual subjects, the PAAE results represent the true "value added" learning gains which each teacher produces. PAAE results measure exactly what a teacher and his/her students know about the subject at the beginning of the school year and what they know at the end.

2. Demonstration schools

A more common approach is the establishment of a small number of full-day, highly resourced secondary schools as "islands of excellence" that both test out innovations and demonstrate to the rest of the system that high quality secondary schools are achievable. The federal government's highly regarded network of technical schools has long been an example of this approach.

Pernambuco's "Escolas de Referência". In 2007, Pernambuco partnered with a set of companies committed to improving education to convert 10 existing secondary schools in to a new model of full-day schools with high quality instruction; by 2010 the program had expanded to 60 full-time and 100 half-day secondary schools. Phillips, Odebrecht, ABN Amro/ Real Bank and Hidreletric Company of São Francisco (Chesf) created the ICE (*Insituto de Co-responsabilidade pela Educação*) in Pernambuco. Under the new management model, the state government is responsible for staff salaries, school feeding, books and uniforms and the ICE finances infrastructure investments, scholarships for low income students, and works with school administrators on results based management. School staff and students are constantly monitored and evaluated during the school year. Teachers receive special support from master teachers for planning lessons and developing instructional materials. A formal state/Institute co-management model runs the program. Although the program as a whole has not been evaluated, the IDEB performance of Pernambuco's 51 *Escolas de referência* in 2009 was 4.9, well above the state's average of 3.0. However, the crucial question for Pernambuco – and the other states embracing this approach – is how the "islands of excellence" translate into system-wide improvement.

3. Public-private partnerships for technical and vocational education

One of the biggest challenges in every country is ensuring a smooth transition to work for secondary education graduates who do not go on to higher education. Public-private partnerships can be enormously helpful in orienting the vocational content of the curriculum to skills that are in local demand and supporting more results-driven school management, as in Pernambuco.

Institutions such as Unibanco Institute, Pão de Açúcar group are investing in secondary public education in partnership with States. Unibanco Insitute's program called *Jovens de futuro* is a 3 year program that supports schools in improving secondary school quality through results-based management. Instituto Unibanco sends a highly qualified team to work with school personnel on the design of a 3 year improvement strategy. The school team is closely monitored and financial support to achieve the targets is provided by Unibanco. The program is now being implemented in 86 schools (69,553 students) in four Brazilian states (Rio de Janeiro, Minas Gerais, Rio Grande do Sul and São Paulo).

Rio de Janeiro state. In the state of Rio, the Pão de Açúcar Group has helped the state to develop a full-time technical education nucleus in food industry for 600 students. These students will finish their education certified as "técnicos em Leite e Derivados, Panificação, Embutidos e Manipulação de Vegetais". NATA (Núcleo Avançado em Tecnologia de Alimentos) is a full day education that will include regular curriculum of secondary education and technical classes.

Minas Gerais PEP (Programa do Ensino Profissionalizante). The largest-scale and most promising approach to date is Minas Gerais' innovative voucher program, called PEP. In an effort to diversify and expand the technical and vocational training options for youths and young adults, the state in 2007 launched the secondary-level voucher. Under the program, the state pays the tuition for students to attend any state-accredited training program, whether offered by a private school, municipal school or industry- based center. The courses are in general 14-24 months long and often organized in partnership with employers. This helps guarantee the relevance of the skills being taught. They also often include a commitment from the enterprise to hire the graduates over the next 5 years. A good example is the new training center in "Sete Lagoas", specialized in metal mechanics and electronics.

In its first two years, the PEP stimulated the development of new courses in 350 of Minas Gerais' 853 municipalities, and increased the number of accredited training institutions from 72 to 296. By 2009, 25,000 students were taking PEP courses. Establishing quality standards for technical and vocational training programs is often a challenge, given the diversity of providers and training content. But it is essential for success in equipping students with skills that are truly marketable. The Minas Gerais state education secretariat has established an impressively serious accreditation process: of 174 institutions reviewed in 2009, 32 were not approved. If quality is maintained, the program should be cost-effective, as it has induced existing private schools and training centers to expand enrollments, making better use of existing capacity, rather than creating duplicate capacity in the public sector. In 2010, 158,000 students applied for the 28,000 new places available in PEP courses. Schools have an incentive to help students stay in school and succeed academically, as the SEE transfers voucher payments to the institutions every two months, based on an audited report of the number of students and their attendance.

As the first wave of PEP students graduates, their transition to the labor market will be the most important indicator of the success of the PEP approach. But thus far, the high demand from students, the rapid supply response from the private sector in generating new training places, and the diversity of vocational and training courses generated in the space of two years are extremely impressive. The record of state-run technical and vocational training in Brazil and many other countries is poor; courses are often relatively expensive (because they re-create industrial equipment in a school setting) yet of low-quality, because both equipment and faculty grow out-of-touch with the labor market. Minas Gerais appears to have found a creative and pragmatic way of avoiding these problems by combining the relative strengths of the public (accreditation, quality assurance and funding equalization) and private (labor market relevance and flexibility) sectors.

D. Maximizing federal impact and capitalizing on the Brazilian "education action lab"

The "managed revolution" of Brazilian education began when the Cardoso government assumed critical normative functions that had previously gone unfilled: equalizing funding across regions, states and municipalities; measuring the learning of all children on a common yardstick;

and protecting the educational opportunity of students from poor families. [61] With those reforms, the first comprehensive legal framework for basic education (the *Lei e Diretrizes de Bases* in 1996), and the first national curriculum guidelines, the Ministry of Education got the core elements of a national education policy profoundly right.

Over the past 15 years this framework has been maintained and in some areas expanded -- perhaps most impressively in the strengthening of INEP into the LAC region's most effective system for assessing student learning and monitoring education results. Other examples of the strong normative role developed by the federal government over the past two administrations include standards for teachers, federally-supported, higher quality teacher training programs, a mandate that meritocratic recruitment processes be used in every school system, and the new federal proposal for a standardized teacher entrance exam that could be of great benefit to smaller states and municipalities. The Ministry has expanded core support roles in textbook screening and production, and the funding of high quality federal technical schools. Finally, the Ministry has consistently supported educational innovation – the FUNDESCOLA program to encourage school-level development planning, the *Escola Ativa*, to transmit an effective model of multi-grade teaching, and the more recent PAR program to strengthen municipal school systems. The student learning improvement Brazil has begun to register is in large measure due to progressive, effective federal policy over a sustained period.

In this context, it is not trivial to identify federal policies that could substantially speed Brazil's progress toward world class basic education. But the analysis in this report points to four:

- *Stay the course on current federal policy*

Close reading of the data suggest that the pace of education progress slowed somewhat after the government transition in 2003, which might be expected. However, as discussed throughout this report, under the second Lula term the most critical axes of federal education policy were strengthened and extended in important ways. The result has been the impressive improvements in education outcomes – on IDEB, on PISA – chronicled in this report. But valuable momentum was lost from 2003-2007. The next minister of education will inherit an institutional framework for sustained progress in basic education that has been built up over 15 years. He or she can reap a high payoff from "staying the course" and minimizing the costs of transition.

- *Focus on spending efficiency*

The broad-based national commitment to improve education supported by the *Todos Pela Educação* movement and the growing number of private industry groups investing in demonstration schools and other initiatives are positive developments. But the emphasis in public education debates on increased spending is not. Brazilian public spending on education is already relatively high and the impending large decline in the size of the school aged population is an opportunity to speed the pace of quality improvement at current spending levels.

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[61] Souza, Paulo Renato, A Revolução Gerenciada: Educação no Brasil 1995-2002

Higher spending *per se* is not negative; the issue is that higher spending can worsen the risks of leakage and corruption. Recent cases of over-invoiced and fraudulent education contracts in Amapá and Tocantins echo the earlier CGU audit report that estimated 13- 55% of FUNDEB funds failed to reach the classroom because of corruption. There is clear scope for better results from current education spending through strategies to reduce corruption. Expanded federal-level random audit programs and communicating transparent information about funding "entitlements" to parents at the school level are two of the best strategies. The impact of corruption on the education system is known; research by Claudio Ferraz cited earlier in this report found evidence of significantly lower test scores and higher repetition rates in randomly-audited municipalities with detected cases of corruption. The mechanisms were clear; fewer resources for teacher salaries, training, infrastructure improvements, and computer labs reached the school level because funding was creamed off the top. There is no inherent reason to expect that even higher budgetary allocations – which often have the effect of relaxing funding pressures and lowering vigilance – would redress this type of leakage rather than exacerbate it.

Poor management of education resources – or irregularities in the use of funds *without* malfeasance -- is also a documented issue that cannot be solved by spending more. CGU auditors also documented municipalities using FUNDEF and FUNDEB funds that were mandated for teacher salaries to pay other municipal workers and countless failures to follow competitive bid rules. While not contributing to private gain, these practices divert resources from education and lower the efficiency of education spending. On the other hand, states, the federal district, and municipalities report instances of poorly-managed federal programs, such as 2 year delays in the delivery of textbooks, even longer waits for infrastructure programs, and botched implementation of the 2009 secondary school exit exam.

If the next minister of education makes improving the impact of existing spending the priority going in, the case for subsequent budget increases, should they be necessary, will stand on far firmer ground.

- *Create incentives for state-wide improvement*.

Brazil has a long tradition of direct funding relationships between the federal government and municipal authorities that historically helped cement political alliances. In education, however, there is little evidence that direct support from the Ministry of Education to municipal education secretariats is an efficient strategy for system-wide improvement. This is not to say that testing out new education initiatives on a pilot scale in selected municipalities cannot be useful. The federal government's FUNDESCOLA program to encourage more autonomous schools was launched in 1999 in a pilot set of municipalities, which provided an efficient platform for testing the concept in different regional contexts in a manageable number of schools.

But it is striking how many federal education programs focus on direct relationships with municipal education systems rather than the obvious alternative – empowering states to be responsible for state-wide educational improvement. The federal PAR program launched in 2009, which offers direct provision of technical assistance to the 200 worst-performing municipal school systems, is the most recent example. The objectives of the program are laudable: to support poor-performing municipal education secretariats in developing comprehensive improvement programs. The modality, however, is questionable: the dispatch of

trained technical teams from Brasilia to distant, sometimes tiny (20 schools or less) municipal education systems.

If anything, the evidence suggests the opposite: the most efficient strategy for improving overall results is closer integration of state and municipal school systems. Many states note what Minas Gerais state secretary Vanessa Guimarães has observed: "Our students come from municipal pre-primary and primary (grades 1-4) schools; either we help improve those schools, or we spend time and resources remediating education deficits when they come into our schools."

Many of the states making greatest progress in improving education results are those that work most closely with their municipal school systems. While most states are moving in this direction, Minas Gerais and Ceará stand out. Minas Gerais has long opened its PROEB (4th and 8th grade) and PROALFA (3rd grade reading) student assessments to all municipalities and the participation is virtually universal. The state's high quality teacher training programs are also always offered to municipal teachers and the majority of teachers attend. The state provides municipal schools with the same textbooks and learning materials it uses in its own schools. Above all, Minas' strong program to strengthen early grade literacy teaching (*Alfabetização no tempo certo*) has been implemented state-wide, in a coordinated effort with municipal school systems. On the 2009 Prova Brasil, the state had the highest 4th and 8th grade Portuguese scores in the country.

Ceará also recognized that the problems of low learning levels and high grade repetition start in pre-school and the early grades of primary school. Almost a decade ago, the state established an innovative matching fund for the construction of early childhood centers, which are a municipal responsibility. For every center built by a municipality, the state funded one additional center. For the poorest municipalities, the matching ratio was even more generous. The state also worked with municipalities in a coordinated effort to strengthen early grade literacy teaching, getting100% of municipalities to sign on to its program. Similar to Minas Gerais' program, Ceará provides training for teachers plus a revamped curriculum, reading materials, lesson plans and regular student progress assessments to instill more effective reading instruction in the first two grades. The state contracted an external testing agency to create an annual reading exam applied to every second grader in the state, starting with a benchmark assessment in 2007. It has also trained all state and municipal first grade teachers in how to conduct periodic formative assessments of children's reading progress, aligned to the goals of the grade two assessments.

Ceará's state-wide strategies for improving results have extended to other grades and subjects and included collaboration on multi-grade teaching, support for school development planning, meritocratic processes for selection of school principals and incentives for teachers. In every case, the state's philosophy is to offer support municipalities can opt to accept or not. High take-up rates attest to the fact that many small municipal education systems lack the technical capacity to launch programs of the quality and coverage the state can mount. The rise in Ceará's 4th grade IDEB results from 3.2 in 2005 to 4.4 in 2009 attests to the fact that both systems gain from integrated state-municipal improvement efforts.

Most other states are moving in these directions too. But the next administration could substantially speed this progress by developing explicit federal-level incentives for state-wide improvement strategies. An interesting example is the current United States government

program “Race to the Top” (RTT), which has several features relevant for Brazil. First, it is the most explicit effort to date in the U.S. to stimulate states to work in a coordinated way with local school districts on state-wide improvement strategies. Second, rather than channel resources to the lower-performing schools, it rewards states for innovative ideas and real progress – creating positive performance incentives. Third, through the “rules of the game” – for example, stipulating that states would be rewarded for programs linking teacher pay to performance -- the federal government created a strong national push in some new policy directions. Fourth, by being highly selective – only 12 states (of 50) are sharing the substantial, $4.35 billion pie – the program has generated strong interest and competition for fresh ideas across all states. Box 4 describes the program in more detail. The salient point is that the use of federal funding to create incentives for state-municipal cooperation, rather than federal-municipal relationships is a radically different paradigm that could have a profound impact on educational progress in Brazil.

- *Capitalize on the Brazilian “education action lab”*

The long-term work of improving primary and secondary school performance is the responsibility of states and municipalities in Brazil. Over 5,500 different education systems create an incredibly rich base of program and policy experience. This report has highlighted a number of innovative and promising programs. But many, many more exist. Literally tens of thousands of creative new education policies and programs are being tried out at this moment across Brazil by dynamic, results-oriented secretaries of education. There are very few countries in the world with the scale, scope and creativity of education policy action that can be seen today in Brazil. Even more unique is the large number of cutting-edge policy areas in which different states and municipalities are experimenting with similar programs with slightly different design features -- like the teacher bonus programs in Minas Gerais, São Paulo, Pernambuco and Rio de Janeiro municipality. The chance to study these systematically makes Brazil one of the world’s best laboratories for generating global evidence on “what works” in education.

One of the most important recommendations for the next federal minister is to mine this rich experience more effectively. While Brazil today might be rated an “A+” in the quality of its education data and the use of data for monitoring, it might be considered a “C” in impact evaluation.

Impact evaluations are studies that can establish a causal link between specific programs or policies and observed results – whether improvements in student learning, student flows, or other outcomes. They are important because causal evidence constitutes a much stronger foundation for program design and policy choices than simple correlation of programs with outcomes. Brazil is not the only middle-income country with a limited tradition of rigorous impact evaluation in education. Countries such as Mexico and Colombia which do more are the exception.

Awareness of the power of rigorous evaluation is spreading in developing countries and many more evaluations are underway today than even five years ago. Global initiatives such as the Spanish Impact Evaluation Fund (SIEF) at the World Bank and the International Institute for Impact Evaluation (IIIE) are helping to finance such research, on the recognition that high

quality impact evaluations generate evidence and knowledge that is useful globally, as well as locally. Support from both funds has helped generate the new Brazilian evidence on teacher incentives and ECD programs presented in this report.

Global research funding can complement, but not substitute for, national evaluation efforts. A growing number of Brazilian academics have the expertise and interest to work with states and municipalities on rigorous evaluations of their innovative programs. The most robust studies are usually designed prospectively, with close collaboration between the research team and the implementing agency. This helps assure the crucial feature of credible evaluations: the identification of a valid comparison group.

Even an annual allocation of $10 million for competitive funding of high caliber education impact evaluations could transform the Brazilian education research landscape. Well-designed new evaluations, using randomization or other technically robust methods, would have high likelihood of attracting research support from global sources as well. A concerted federal strategy to support systematic research and knowledge generation from the Brazilian "education action lab" might be the single fastest road to world class education.

Box 5: The United States' "Race to the Top" Program

In February 2009, the U.S. Department of Education launched a program of competitive grants awarded to states to fund innovative and ambitious reforms in public education, from kindergarten to 12th grade, called the Race to the Top program (RTT). The 1st and 2nd phases of the program awarded a total of $4.35 billion in grants to 12 states and will impact an estimated 13.6 million students, 980,000 teachers, and 25,000 schools.

RTT's goal is to encourage states to create the conditions for long-term educational improvement and student achievement, and to reward the states with the best and most viable plans. States' proposals must show plans for comprehensive education reform in 4 vital areas: (i) adopting standards and assessments that prepare students to succeed in college and the workplace and to compete in the global economy; (ii) building data systems that measure student growth and success, and inform teachers and principals about how they can improve instruction; (iii) recruiting, developing, rewarding, and retaining effective teachers and principals, especially where they are needed most; and (iv) turning around the lowest-achieving schools.

The plans are judged by panels of education experts on the basis of weighted criteria, which in turn are based on a system of points and priorities, including:

- forming and maintaining Great Teachers and Leaders (28%), and ensuring their equitable distribution;
- State Success Factors (25%), including capacity building, raising achievement and closing gaps;
- developing and adopting Standards and Assessments (14%);
- General Selection Criteria (11%), including ensuring successful conditions for high-performing charter schools;
- Turning Around the Lowest-Achieving Schools (10%);
- implementing Data Systems to Support Instruction (9%) and
- emphasizing Science, Technology, Engineering, and Math (STEM) education (3%).

At least 50% of the grant must be allotted to local school districts within the state that agree to participate in the reform program; states have flexibility in how to use the balance of funding. The grant is dispensed gradually, as the winning states meet established benchmarks.

During phase 1, the states of Delaware and Tennessee won grants, and in August of 2010 the phase 2 winners were announced: the District of Columbia, Florida, Georgia, Hawaii, Maryland, Massachusetts, New York, North Carolina, Ohio, and Rhode Island.

The RTT is viewed as highly successful in achieving the federal Department of Education's core goal: to create a dynamic that encourages states to undertake difficult reforms, spreads the best reform ideas, and sets in motion effective reforms that will serve as models for other states to follow. Some of the reforms enacted by the first round winners are: adopting common learning standards in reading and math, creating incentives to put the most effective teachers in high-need schools, and developing alternative means of teacher and principal certification. A positive externality of the competition has been that it encouraged states to undertake reforms even before winning, in order to increase their chances of receiving RTT grants.

Criticism of the program has centered on the selection process, which was to some extent subjective; a few states which have implemented well-known and highly-regarded reform did not win (Colorado and Louisiana) and others which have been ranked low on quality by national organizations in the past did win (Ohio, Maryland, New York and Hawaii). Critics also maintain that the program over-emphasizes momentary reform trends in education rather than long-term progress. Several teachers' unions have come out against the program as interference from the federal government.

However, the media attention RTT has brought to issues of education reform and the new dynamic around federal-state relations – rewarding competitive efforts to improve rather than supporting areas of persistent failure – has led President Obama already to request $1.35 billion in funding for phase 3 of the program.

Sources: U.S. Department of Education, National Review Online, Education Week

Contributed by Debora Brakarz.

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ANNEX 1: Delivering results for children in Rio's favelas: Escola Municipal Affonso Varzea

7 am at the Escola Municipal Affonso Varzea in one of Rio's most violent favelas, the Complexo do Alemão. Director Eliane Saback Sampaio stands at the school door, greeting all 1,100 students personally, as they politely file in. With a hug, a compliment, or a message about the importance of hand-washing and eating healthy foods, Eliane's warm smile is the first image of school for these students each day.

On this July day, the school is abuzz with the 2009 IDEB results. Affonso Varzea surpassed its target of 4.8-- achieving 5.8. Only 17 other schools in the entire, 1,300-school municipal system achieved an IDEB over 5.5. Education secretary Claudia Costin personally called Elaine to congratulate her and the school for their achievement. After 19 years as director and 23 years working at the school, Elaine was justifiably proud of the results.

Trained in mathematics, with advanced degrees in pedagogy and school administration, Eliane is an impressive figure. She believes strongly in empowering those around her; her "*Prata da casa*" program gives teachers funding for special projects they develop jointly with their classes -- ranging from dance and music performances to IT training. Eliane extends the same support to the school's lunch ladies and the "*mães amigas*" who assist them; together they developed the project "*Faça de sua alimentação uma alegria*" ("Make cooking fun!") in which marionettes perform little plays on how to cook different healthy foods, and in the process teach units of measure and how to use fractions.

But Eliane's greatest passion is reserved for her "children" and "grandchildren" at Affonso Varzea: "Our students are my children and at this point many students in this school are the children of earlier students. You will see – if I go into any classroom and ask who are my grandchildren, many, many children will raise their hands!"

Visitors to Affonso Varzea are struck by the pristine cleanliness of the school and students' polite behavior. The walls are full of children's art, poems and essays. The school's infrastructure is impressive – it has a dance studio, auditorium, reading room, toy room, computer lab, and 16 classrooms. There are numerous "reading corners" with shelves full of books, including one right at the door of the school – so that parents can easily take home books to share with their children. This was an idea of teacher Fabiana Dutra.

Thirty-five year old Fabiana Dutra has a degree in pedagogy from the University of Rio de Janeiro, has taught in the municipal school system since 1995 and has been at Affonso Varzea since 2006. Fabiana never considered another occupation; her mother was a teacher and Fabiana has always been in love with books and the arts. Her house in the *Engenho da Rainha* neighborhood north of Rio is full of books and has poetry written on the walls. Fabiana reads compulsively (four books a week), frequently attends classical music concerts and theater, and loves to share the parks and flowers of Rio de Janeiro with her 4 year old son, Felipe. She wakes every day at 6 am to leave Felipe with her mother on her way to work. Fabiana has two jobs with the Rio municipal schools. In the mornings she works as a roving "master teacher" of early grade reading in 6 different municipal schools, giving demonstration lessons and providing feedback and guidance to teachers, as part of the *Se Liga* and *Acelera* programs run by the

Ayrton Senna Foundation. In the afternoon, Fabiana is librarian at Affonso Varzea. Her day officially ends at 5:30 pm, but like other teachers Fabiana almost always has substantial work to do at home, planning activities for the following week. It is not unusual for her to finish at 11 pm.

Fabiana is passionate about the work she does today. But she still remembers her first years in teaching and how ill-prepared she felt. Her first assignment was in the "literacy" class at the Rio school CIEP Coronel Sarmiento, near the *Complexo do Alemão*. Expecting young children, she was shocked to find 13 e 14 year olds in her class. "Nothing in the theory I was taught at the university prepared me for dealing with the reality of these children, who had spent years in school but still couldn't read." Only the help of other teachers, voracious outside reading on how to teach literacy, and endless experimentation enabled her, after several years, to develop effective strategies for helping *all* children read.

Fabiana's students grow up in a world of violence and drugs. Most have never set foot outside the favela, been to a Rio beach, or even seen a shopping mall. The school is a respected island in the community and for many students the cleanest and safest place they know. Many children at Affonso Varzea want to use the bathrooms "all day long" reports Eliane, as these are the only bathrooms they have ever seen with toilets and sinks. Fabiana works hard to design reading and writing assignments that help her students articulate their fears and frustrations, develop self-esteem, and connect with the wider world. In one project, students monitored Rio's newspapers, searching for articles mentioning the *Complexo do Alemão*. They analyzed the tone and coverage of the articles and concluded it only appeared in the news in connection with violence. Fabiana's assignment was for the students to create an alternative newspaper about their community, reporting only the positive, and illustrating their articles with hand-drawn "photos" of football games, neighborhood parties, barbeques and street fairs. In another assignment, Fabiana asked students to choose poems that meant something to them and then to write a letter to the poet. The letters were deposited in the school mailbox and opened on the first day of the school's poetry fair – helping each child make a personal connection with great literary works.

It is not easy to keep Affonso Varzea staffed with talented and committed teachers. Despite strong support from the Municipal secretary and a cohesive school environment, teachers are free to request rotation to safer areas and each year, many do. But Rio's recent policies are making a difference – above all the *Escolas do Amanhã* (Schools for Tomorrow) program. The 150 Rio schools, such as Affonso Varzea, that are in high conflict areas receive special support, including infrastructure improvements, books and materials, and incentive pay offered to teachers who work in these schools. Other recent system-wide policies are also viewed positively, such as new curriculum guidelines books and materials for teachers, and bi-monthly student assessments. While Affonso Varzea's team supports Rio's teacher bonus program and believes it is helping schools to focus on concrete targets for improving results, they see issues with the strict policy on teacher absences. In schools that earn the bonus, teachers with more than 5 absences that year – whether medically excused or not – do not receive any bonus, and teachers with 4, 3 or 2 absences have their bonuses discounted. Concerns include the incentive for teachers to work even if they are sick with communicable diseases, and the chance that teachers with more than 5 absences will "give up" for the year, prejudicing the work of the school as a whole.

The city's ongoing research on the impact of the bonus program will help to answer these questions over time. The teachers at Affonso Varzea are no different from those in other schools in many ways. They respond to financial incentives; they respond to non-pecuniary incentives, such as the city's public appreciation of their results; and they see their work enhanced by effective support from the central administration. But these teachers also work in some of the most difficult school conditions in the world. Every day, Eliane, Fabiana and many other teachers go "above and beyond" the normal work of a teacher – or any professional – and their core motivation is the difference they make in children's lives. Fabiana points with deep pride to the number of ex-students who have moved out of the favela and are studying at a university or working in a stable job. Eliane can see a whole generation of children in *Complexo Alemão* whose lives have taken a better track as a result of her work. Rio's municipal education secretary rightly calls them "heroes".

Contributed by Erica Amorim.

ANNEX 2: Delivering Results for Children in Northeast Brazil: Pernambuco Escola Estadual Tomé Francisco

6 am in Lagoa da Cruz, a small town in the Sertão desert along the border between Pernambuco and Paraíba.

Ângela Maria de Oliveira, 44, wakes her 9 year old daughter Emanuelle and the two set off for the state school Tomé Francisco where Ângela teaches. Miles from the nearest paved road, Ângela and Emanuelle walk to the school through dry fields, shooing chickens and cows as they go.

Every morning Ângela teaches the 3rd grade in a class of 28 students, who are engaged and excited about the activities assigned. According to them "she is the coolest teacher," as she always assigns activities that incorporate games along with learning, and seats the children in a circle in order to facilitate interaction. Ângela also teaches two 7th grade history classes and a 6th grade science class. After the end of the work day, at 6:10 PM, she returns to her mother's house, cooks dinner for the family, helps her daughter with her homework, and finally returns to her own house to sleep.

Ângela's dedication and her students' engagement, along with that of the other teachers, students and staff of the school, have contributed to Tomé Francisco's ascendance as a model school in the state. Since 2005 the school's results have consistently been well above the Pernambuco state mean in all levels, and in 2009 it reached 1st place in the IDEPE for grades 1-4. The school achieved 100% of its targets under the state's pay for performance bonus during both years that the program has been in operation and thus all personnel have received the maximum salary bonus for both 2008 and 2009. Francisco Tome's principal has received the state award for School Management excellence; the school has received a major school infrastructure reform; and – in acknowledgement of the schools' achievements -- the Governor has even promised to build a road that will connect Lagoa da Cruz to the capital of the municipality. The school is clearly a source of pride for the entire community.

Most families in the vicinity of Francisco Tome subsist on income from seasonal work in sugar cane plantations and from unemployment benefits during the off-season. Approximately 30% of the students receive Bolsa Família benefits, and 15% of students count bolsa familia transfers as the only source of family income. Yet all of Francisco Tome's students believe that doing well in school is critical for their futures and the school reports no attendance problems. Indeed, for these children, some of the "returns" to education are already being seen in the short-term, with the positive attention the school has achieved within the state.

Nonetheless, the school still faces difficulty in recruiting and maintaining staff to work in such a remote location. According to the director, only those who were "born there, or marry a native" end up staying. Staff from other areas eventually request transfers to schools closer to their own home community or to bigger towns. Tomé Francisco is always short of cleaning, cafeteria, library and teaching staff. Yet Ângela claims to be satisfied with her job and, with a timid smile, proclaims that "it is no use to complain to those who are not at fault."

Funds for school inputs are scarce, but the staff of Tomé Francisco tries to manage this by buying food through installment plans in order to guarantee good lunches for the students when

the state funds are delayed, and forming partnerships with other institutions in order to guarantee a variety of activities for the students. The teachers also contribute substantially. Ângela, for example, bought a Xerox machine for the school with her own money, as it only owned mimeograph machine.

The school's outstanding success has created a new challenge: it is not easy to exceed the current results each year, given that those are the best in the state! In order to accomplish this, everyone in the school works towards organizing events, sports activities, literature and music workshops, and other initiatives to spark children's love of learning.

After some years teaching the first four grades of primary school, Ângela decided to pursue a graduate degree in history at night in order to qualify to teach the middle grades. This routine of working during the day and studying at night is very common among the teachers in the school. Ângela becomes emotional as she remembers the difficult routine and the dangerous transportation she had to take in order go to the university in the neighboring town. However, she still dreams of one day returning to school: when she retires in 6 years she plans on pursuing a psychology degree.

Ângela's since she was a child was to become a teacher. In her small town with few job opportunities, the teaching profession is still respected. The teachers and administrators of Tomé Francisco love to see their students become educators, despite what they perceive as a low financial return relative to the long hours of work.

Dedicated teachers like Ângela have a dedicated leader to rely on. The principal of the school, Ivan, has been leading the school for 12 years, and divides his time between his day-to-day activities and the journalists that come every week to see this phenomenal school in the remotest part of the *sertão*. Ivan believes that the main differences that put Tomé Francisco ahead are the sense of teamwork and sharing of good teaching practices among the staff and the strong support from parents, visible during bi-monthly meetings of parents with their children's teachers. The closeness of the community is visible, on signs throughout the school, in a bi-monthly school newspaper, and on an internet blog.

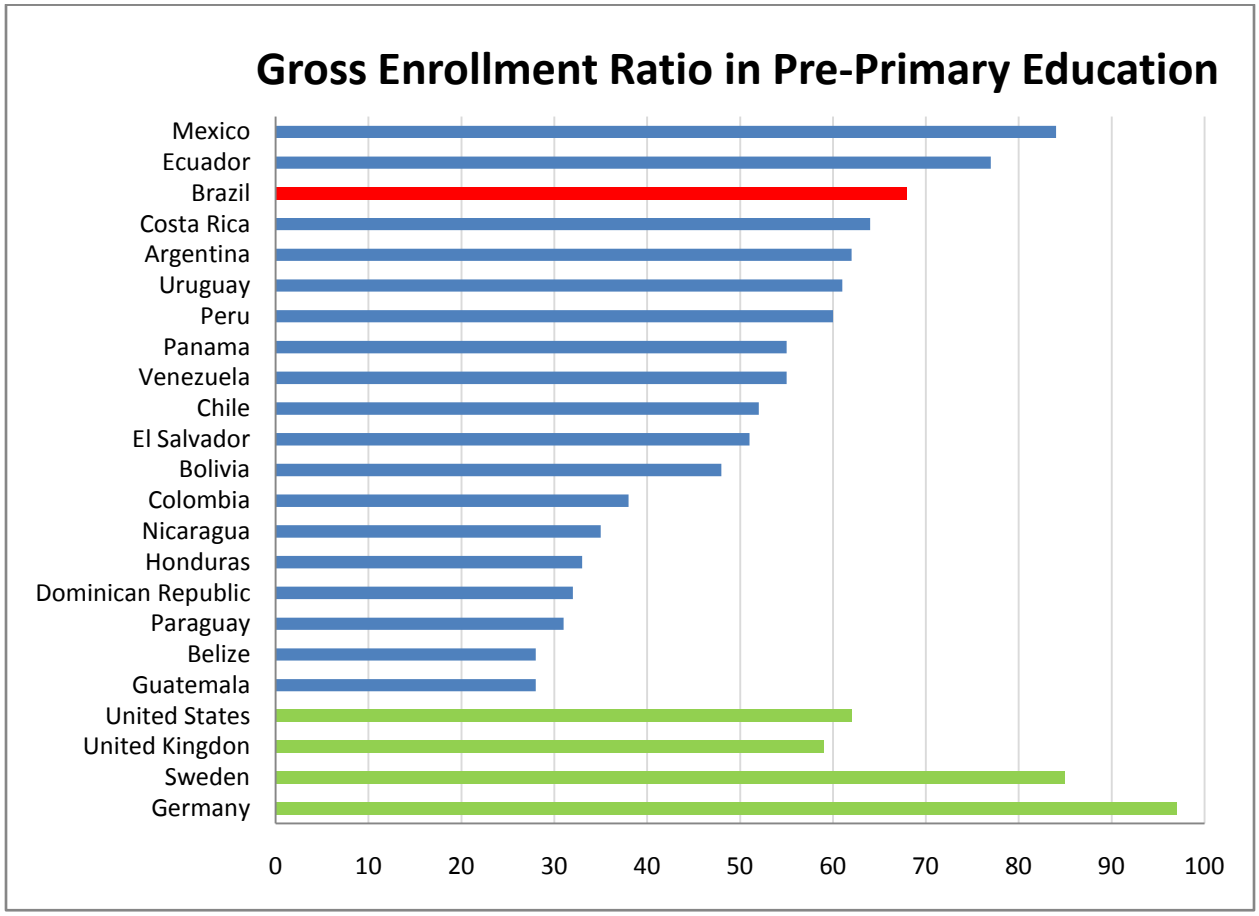
Ivan was elected principal of the school and believes that the democratic school administration was a great improvement for the state. Ângela and the other teachers in the school strongly support the new policies of the state government. They consider the teacher bonus program a great motivator for the improvement of the school, and very much support the fact that *all* staff members in a school receive the bonus, as they are all involved in the education of the student. However, Ângela warns against the bonus becoming the only salary policy or the only way to motivate staff.

In this lovely school, the greatest challenge is to maintain its exceptional results. All of the teachers claim to be happy with their chosen profession, and are clearly excited to see that their students "are learning in school." With great affection, a teacher remembers advice Ângela once gave her to during a difficult time: "the teaching profession is a bitter one, but when it is carried out with love, it becomes very sweet."

Contributed by Tassia Cruz.

ANNEX 3: Access and quality of ECD coverage in Brazil – compared with the OECD and LAC

Brazil is one of Latin America's leaders in terms of coverage in pre-primary education, only behind Mexico and Ecuador in enrollment. In fact, it even exceeds several OECD countries, such as the United States and the United Kingdom. One reason for this is that Brazil has, for the youngest children, made universal publicly provided crèche care a goal, whereas universal publicly provided education in the United States – for example – is only provided from age five onward. In addition, access both to crèche care and pre-schools has been expanding rapidly across Brazil and is likely to continue to do so.

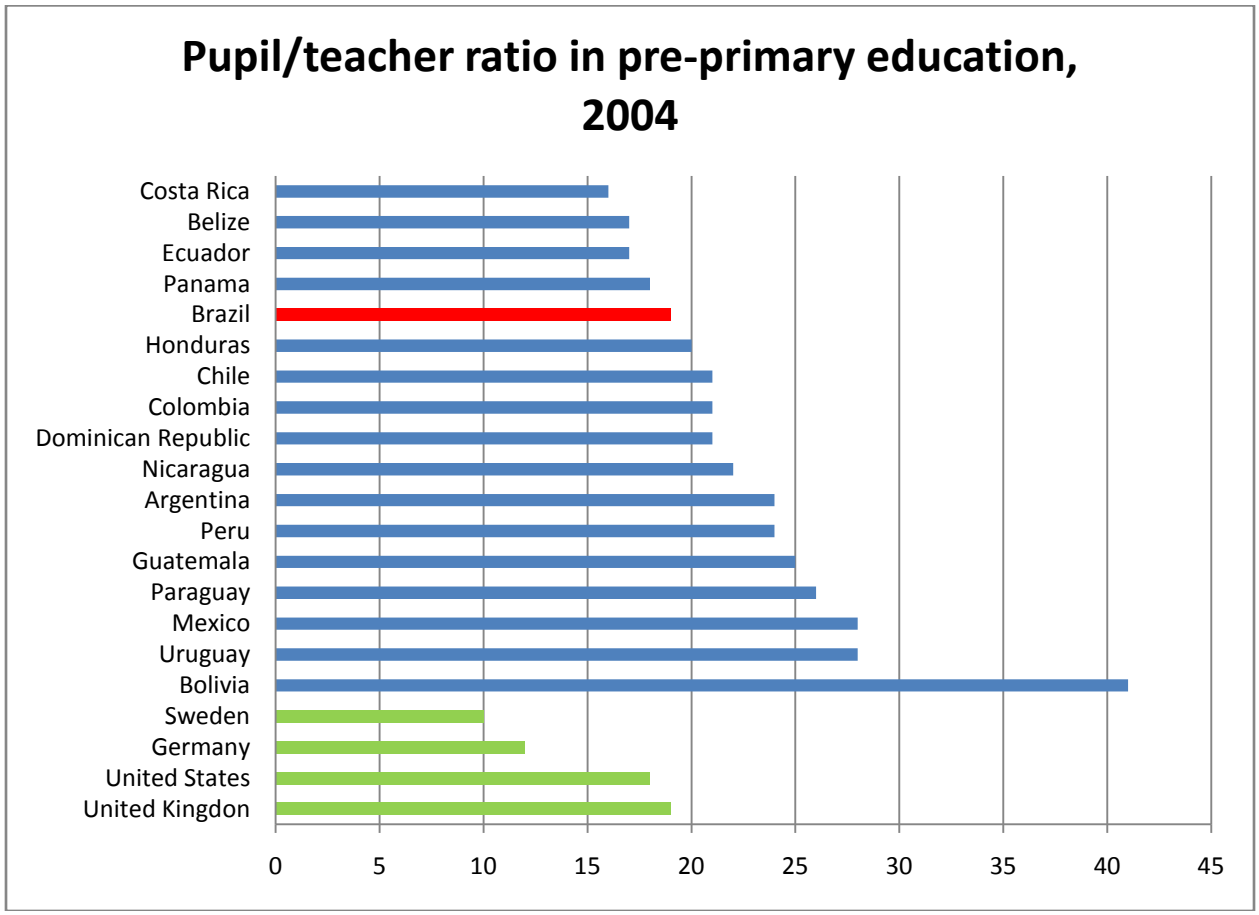


Source: UNESCO, "Strong Foundations: Early Childhood Care and Education. EFA Global Monitoring Report 2007", 2006, Appendix Table 12.

This overall high rate of coverage masks massive variation across states in crèche and pre-school coverage. The maps below demonstrate crèche and preschool access across the states of Brazil, demonstrating massive variation, from northern states with crèche enrollment under ten percent to southern states with over twenty percent crèche enrollment. Likewise, several states in the northeast and east of Brazil have pre-school enrollments exceeding 75% (or even 85%), whereas several in the central west have much lower rates of enrollment.

Source: Evans D, and K Kosec, "Access to Early Child Education in Brazil"

Even as access continues to expand, it is only one piece of the story. Quality is truly the lynchpin: Some evidence from large-scale early child care programs – discussed in the next section – suggest that large-scale child care programs, if quality is not maintained, can be detrimental to student performance. International indicators of quality are limited, but one indicator for pre-primary education, the pupil-teacher ratio, suggests that Brazil is better than average but still not the Latin American leader.



Source: UNESCO, "Strong Foundations: Early Childhood Care and Education. EFA Global Monitoring Report 2007", 2006, Appendix Table 10A (CONFIRM).

Furthermore, a recent study in six state capitals around Brazil (Belém, Campo Grande, Florianópolis, Fortaleza, Rio de Janeiro, and Teresinha) carefully examined the quality of pre-primary institutions in 18 to 30 institutions per state across a broad range of characteristics including personal care, activities, interaction, space and equipment, program structure, teaching speaking and comprehension, and the faculty and parent involvement.[62] Taking all these areas together, 50% of crèches surveyed were judged to be "Inadequate" according to a standardized

[62] Campos MM et al., "Educação Infantil no Brasil: Avaliação Qualitativa e Quantitativa," Fundação Carlos Chagas, 2010.

international scale, whereas just 1% of crèches were judged to be "Good."[63] The other categories were "Basic" (37%) and "Adequate" (12%). At the pre-school level, quality was slightly better, with 30% of pre-schools found to be Inadequate and 4% found to be Good. (42% were Basic and 24% were Adequate.) However, these numbers indicate major room for improvements. At both levels of education, the very weakest area was activities for the children, including the provision of blocks for play, music and movement activities, activities demonstrating nature and science principles, et cetera.

[63] For crèches, the instrument used was the Infant/Toddler Environment Rating Scale, Revised Edition (ITERS-R) and for pre-schools, the Early Childhood Environment Rating Scale, Revised Edition (ECERS-R) was used.

ANNEX 4: Global evidence on universal vs. targeted ECD coverage

The best evidence on the effectiveness of early child education stems from high-quality programs targeted toward vulnerable children in the United States. Both the Perry Pre-school Program, which provided pre-school and home visits to children age 3-5, and the Abecedarian program, which provided full-day pre-school to children from four months of age, led to major improvements in short and long-term education performance, including finishing high school on time and completing university study, in addition to a range of long-term broader life impacts, such as reductions in unemployment and arrests at age forty.[64]

These were both small programs, targeting fewer than 150 needy children each. The Head Start program in the United States still targets low-income children with pre-school for 3, 4, and 5 year olds, but reaches approximately 800,000 children each year. Several evaluations, including a randomized trial, have all suggested that Head Start has positive effects on cognitive ability (especially language ability) and grade progression, and there is evidence that the program reduces crime and other behavior programs.[65]

On larger scale, less targeted programs, which is what Brazil's current crèche and pre-school policy would lead to, the evidence is more mixed, as demonstrated in the below table. Some evaluations have found positive evidence on educational outcomes and behaviors (e.g., Argentina and Norway), and others have found negative behavioral outcomes (e.g., Quebec). Clearly there is a great deal of variation across these programs.

[64] Barnett S, "Economics of Early Childhood Development Investments," presentation for World Bank – Municipality of Rio de Janeiro – MEC ECD Conference, July 2009. [I can get the papers.]
[65] Almond D and J Currie, "Human Capital Development Before Age Five," NBER Working Paper 15827, March 2010.

Table 4.1: Impact Evaluation Evidence on Large-scale/universal Early Child Education Programs

Site studied	Program evaluated	Results
Argentina[66]	Expansion of pre-school (age 3-5)	• Improvement in third-grade test scores • Improvement in self-control (i.e., attention, effort, class participation, and discipline)
Denmark[67]	Center-based care (age 3) compared to informal "family day care" (a person in the community provides care in her home) compared to parental care	• No cognitive or behavioral differences at age 11
Norway[68]	Expansion of government provided childcare (age 3-6)	• At age 30, positive impacts on educational attainment and labor market attachment • Reduced welfare dependency
Quebec (Canada)[69]	Expansion of daycare (age 0-4) in 1990s	• Adverse impacts on child anxiety, aggressiveness, and motor-social skills • Adverse impacts on child being in "excellent" health
USA[70]	Expansion of kindergarten (age 5)	• Improved high school completion for white children • No benefits for black children (likely because universal kindergarten crowded out more targeted programs)

In Brazil, data on the impact of crèches and pre-schools is limited. Earlier research found a positive correlation between pre-school attendance and both education attainment earnings for those who attended pre-school, but the study looks at individuals who attended pre-school

[66] Berlinski S, S Galiani, P Gertler. "The effect of pre-primary education on primary school performance." Journal of Public Economics 93 (2009) 219-234.
[67] Gupta N and M Simonsen, "Effects of Universal Child Care Participation on Pre-teen Skills and Risky Behaviours," European Association of Labor Economists Working Paper, 2010.
[68] Havnes T and M Mogstad, "No Child Left Behind Universal Child Care and Children's Long-Run Outcomes," Statistics Norway Discussion Paper 582, May 2009. http://www.uis.no/getfile.php/SV/Magne%20Mogstad.pdf
[69] Baker M, J Gruber, K Milligan, "Universal Childcare, Maternal Labor Supply And Family Well-Being," Journal of Political Economy 116(4), 2008, p. 709-745.
[70] Cascio E, "Do Investments in Universal Early Education Pay Off? Long-term Effects of Introducing Kindergartens into Public Schools," NBER Working Paper 14951, May 2009.

between 1937 and 1976, and the methodology essentially involves comparing people who seem similar but with the difference of whether they attended pre-school or not.[71] (This kind of comparison is challenging, since families that invest in pre-school may also invest in other opportunities for their children, not captured in the analysis.) A recent study by Fundação Carlos Chagas compares the performance on Provinha Brasil of children who attended early child education institutions to those who did not in three cities (Campo Grande, Florianópolis, Teresina) and finds that early child education explains about half of differences between students on the Provinha. A rigorous evaluation of Rio de Janeiro's crèches is expected to deliver results at the end of 2010.

[71] World Bank (2001) "Brazil Early Child Development in Brazil: A Focus on the Impact of Preschools". September. Report No. 22841-BR (preliminary, June 9, 2000).

ANNEX 5: Skills composition in the Brazilian Labor Market

We based our analysis of the change in skills compositions in the ideas and works proposed by Murnane to explain changes occurred in the US Labor Market due to changes in the demand and supply of particular skills and abilities provided by the workers. Thus, we go beyond a secular description of the changes in shares by specific occupations because they might not signal appropriately the skills and abilities required in a context of rapid education expansion and limited quality.

Our first step was to use an occupational classification scheme to identify and estimate the importance of each skill for the most important occupations in the labor market. The initial intention was to base our analysis in a scheme for Brazil but such information is not available for Brazil. Thus, we aim to look for an alternative source that provides such detailed information.

We find that the Occupational Network Database (ONET), while not a perfect match, is an appropriate reference scheme available at this moment. The ONET provides detail information on the importance of each skill and tasks in every occupation. Because, such information is reported by peers or people familial with the skills demanded by the the occupation, we argue that it provides and adequate representation of how important is each skill in a given occupation to perform adequately in the labor market. This dataset provides the percentual distribution of the importance of each set of skills measured in a scale of importance of 5 points. It also provides aggregated information on the average score in the same scale. It is the latter that we use for our analysis.

In operational terms, we used a series of datasets corresponding to the PNAD. In each dataset we can identify the occupation reported by every individual and eventually we could map them to the occupation in ONET. An initial limitation was that PNAD used at least three different occupational classification schemes during the 1980 to 2000 so we needed to find its respective equivalence. To tackle this problem we use equivalence tables available from different sources. In the end we map most of the occupations to the International Standard Classification of Occupations version 1988 (ISCO-88) developed by the International Labor Organization (ILO). To make it compatible with ONET we aggregate the occupations in the ONET database to the US-Bureau of Labor Standard Occupational Classification (SOC) System in its 2000 version and then map it to the ISCO88 scheme using the Gazenboom and Treiman standardization routines. This approach proved to be more satisfactory in terms of coverage than the initial mapping we did based on the 70 occupations in the Brazilian labor market identified for every decade which represented a share of around 80% of the population occupied in the labor market. In both cases, it remains as a limitation that some occupations do not have skills importance scores attached. This is a problem when occupations lack the scores because it has not been established in the ONET dataset. Usually this occurs with occupations in the lowest ladder of the occupational structure. Given Brazilian occupational structure, lack of information in occupations that accounts a significant part of the labor force biases the scores upwardly (i.e. workers on self-sustained agriculture represents approximately 9% of the total labor force).

The equivalence table allowed us to match occupation by occupation and have the importance scores for each of the skills required. For our purposes, we build a set of composite measures of

the skills identified by Acemoglu and Author (2010) using the ONET dataset also. We end with a set of five composite measures comprising a total of 16 tasks scales. Specific tasks that make up each aggregated measures are presented below.

Grouped Task	Specific Task
Non-routine cognitive: Analytical	Analyzing data/information
	Thinking creatively
	Interpreting information for others
Non-routine cognitive: Interpersonal	Establishing and maintaining personal relationships
	Guiding, directing and motivating subordinates
	Coaching/developing others
Routine cognitive	Importance of repeating the same tasks
	Importance of being exact or accurate
	Structured v. Unstructured work (reverse)
Routine manual	Pace determined by speed of equipment
	Controlling machines and processes
	Spend time making repetitive motions
Non-routine manual physical	Operating vehicles, mechanized devices, or equipment
	Spend time using hands to handle, control or feel objects, tools or controls
	Manual dexterity
	Spatial orientation

Source: Acemoglu and Autor (2010)

Composite Scores by Income

The next set of tables shows the average score for each of the composite task measures disaggregated by income quintiles for selected years in there different periods. Scores are expressed in its original 1 to 5 scale. In general, we observed a trend that indicates an increase in the average score of the cognitive-related tasks in every period. However, manual tasks scores also tend to lose importance during the 80s and remain relatively stable in the 2000s.

As expected, those individuals in the lowest quintiles tend to score high in routine-manual related occupations while those in higher quintile show higher scores in the non-routine cognitive tasks. This might suggests that the labor market rewards highly specialized skills appropriately.

Brazil: Average Composite Task Scores by Income Quintiles, Selected years.

1981

Income Quintile	Non-routine cognitive: Analytical	Non-routine cognitive: Interpersonal	Routine cognitive	Routine manual	Non-routine manual physical
Q 1	2.543	2.819	2.839	2.838	2.724
Q 2	2.651	2.844	2.923	2.818	2.762
Q 3	2.706	2.864	2.989	2.746	2.697
Q 4	2.820	2.924	3.045	2.632	2.576
Q 5	3.126	3.124	3.039	2.374	2.245
Total	2.757	2.909	2.961	2.692	2.610

1989

Income Quintile	Non-routine cognitive: Analytical	Non-routine cognitive: Interpersonal	Routine cognitive	Routine manual	Non-routine manual physical
Q 1	2.549	2.828	2.837	2.787	2.684
Q 2	2.605	2.819	2.972	2.766	2.650
Q 3	2.697	2.872	2.998	2.691	2.607
Q 4	2.833	2.953	3.023	2.588	2.509
Q 5	3.111	3.156	3.012	2.350	2.222
Total	2.755	2.924	2.964	2.639	2.537

1992

Income Quintile	Non-routine cognitive: Analytical	Non-routine cognitive: Interpersonal	Routine cognitive	Routine manual	Non-routine manual physical
Q 1	2.568	2.839	2.831	2.795	2.699
Q 2	2.579	2.821	2.937	2.769	2.648
Q 3	2.673	2.865	2.993	2.695	2.596
Q 4	2.826	2.959	3.028	2.574	2.480
Q 5	3.137	3.152	3.059	2.390	2.229
Total	2.752	2.925	2.966	2.648	2.535

1998

Income Quintile	Non-routine cognitive: Analytical	Non-routine cognitive: Interpersonal	Routine cognitive	Routine manual	Non-routine manual physical
Q 1	2.565	2.832	2.844	2.779	2.702
Q 2	2.573	2.827	2.939	2.735	2.622
Q 3	2.663	2.870	3.008	2.678	2.564
Q 4	2.810	2.969	3.026	2.568	2.468
Q 5	3.184	3.212	3.032	2.340	2.189
Total	2.757	2.941	2.968	2.622	2.511

2002

Income Quintile	Non-routine cognitive: Analytical	Non-routine cognitive: Interpersonal	Routine cognitive	Routine manual	Non-routine manual physical
Q 1	2.521	2.814	2.862	2.697	2.612
Q 2	2.549	2.818	2.987	2.727	2.586
Q 3	2.647	2.861	3.044	2.699	2.580
Q 4	2.829	2.967	3.063	2.587	2.530
Q 5	3.235	3.244	3.019	2.291	2.195
Total	2.762	2.944	2.997	2.597	2.497

2008

Income Quintile	Non-routine cognitive: Analytical	Non-routine cognitive: Interpersonal	Routine cognitive	Routine manual	Non-routine manual physical
Q 1	2.540	2.822	2.898	2.681	2.600
Q 2	2.552	2.805	3.031	2.721	2.554
Q 3	2.659	2.859	3.064	2.684	2.562
Q 4	2.849	2.969	3.078	2.588	2.514
Q 5	3.262	3.254	3.022	2.296	2.199
Total	2.780	2.946	3.022	2.591	2.484

Source: PNAD for selected years
Elaboration: Authors

Note: Task Scores estimated based ONET database and following procedures detailed in Acemoglu and Autor (2010). Scores are in a scale from 1 to 5, where 1 denotes less importance and 5 indicates more importance.

Changes in specific task requirements

A plausible explanation for the lack of change in the skills distribution might be attributed to a slow pace in the changes in the skills distribution regardless of the changes in the proportion of occupations. To illustrate this point we estimate the importance of every task within occupations for some selected years is. In table A5.1 we report the percentage of occupations that considered every task as important measured in a 1 to 5 scale. We observe that in most of the cases the level of importance for every task that composes every mayor skill has remained stable in a period of almost 30 years. Some exceptions apply for every specific task but those changes are not enough to bring an overall change.

For the sake of comparison with a different economy we estimate a similar table for the United States using the American Community Survey for the 2006-2008 years. We restrict the

population of comparison to Native Born to wipe the possible immigration effect. As expected, when we compare the last year in Brazil and the last in the US we observe differences.

Tabla A5.1
Importance of Specific Skills

Group Task Name	Specific Task	1981	1989	1992	1999	2002	2008	US Native Born (ACS, 2006-2008)
Non-routine cognitive: Analytical	Analyzing data/information	2%	2%	2%	3%	3%	4%	10%
	Thinking creatively	5%	6%	5%	6%	7%	7%	12%
	Interpreting information for others	2%	2%	2%	2%	3%	3%	6%
Non-routine cognitive: Interpersonal	Establishing and maintaining personal relationships	5%	6%	5%	6%	14%	14%	29%
	Guiding, directing and motivating subordinates	2%	4%	3%	4%	1%	1%	6%
	Coaching/developing others	1%	1%	2%	2%	3%	4%	8%
Routine cognitive	Importance of being exact or accurate	35%	38%	33%	34%	42%	45%	61%
	Importance of repeating the same tasks	9%	9%	8%	8%	8%	9%	16%
	Structured v. Unstructured work (reverse)	53%	51%	53%	51%	42%	41%	51%
Routine manual	Controlling machines and processes	4%	4%	4%	3%	5%	5%	4%
	Spend time making repetitive motions	11%	11%	11%	12%	16%	15%	14%
	Pace determined by speed of equipment	2%	2%	2%	2%	3%	3%	1%
Non-routine manual physical	Spatial orientation	0%	0%	0%	0%	0%	0%	1%
	Manual dexterity	1%	1%	0%	0%	1%	1%	1%
	Operating vehicles, mechanized devices, or equipment	1%	1%	1%	1%	6%	5%	6%
	Spend time using hands to handle, control or feel objects, tools or controls	23%	23%	21%	21%	25%	26%	18%

Note: Each figure indicate the percentage of occupations where the skill is considered important or very important to perform adequately in the occupation out of the total number of occupations in every year.

Finally, we combine the "non-routine" or high level analytical, interpersonal and manual skills that Autor et al christened "new economy skills" into a single variable, and we compare this with "routine cognitive skills" and with routine manual skills (Table A5.2)

Table A5.2

Trends in Skills Distribution in Brazil and the United States, 1980-2009

		New Economy	Routine Cognitive Skills	Routine Manual Skills
United States	1980	50	50	50
United States	2008	55	47	47
Brazil	1981	48	30	58
Brazil	1986	47	31	57
Brazil	1992	48	29	57
Brazil	1997	48	30	56
Brazil	2002	47	37	56
Brazil	2005	47	39	55
Brazil	2009	48	40	54

Sources:
United States: 5% sample of 1980 US Census and 2006-2008 American Community Survey
Brazil: PNAD Survey, various years between 1981-2009

Notes:
The figures in this table show the changes in skills distribution using as a reference point the percentile distribution of the skills in the United States in 1980. By definition, the mean percentile is set in 50 for 1980, and the rest of figures are calculated using that distribution.

ANNEX 6: TABLES

Table 6.1: Composition of Total Education Spending, by Level of Education and Leval of Government, 2009

	Municipality		State		Federal		TOTAL	
	R$	%	R$	%	R$	%	R$	%
EDUCATION	**61,937,211,559**	**37**	**70,573,752,076**	**42**	**36,679,526,521**	**22**	**169,190,490,156**	**100**
▪ Primary	44,615,718,141	59	29,742,536,932	40	723,619,569	1	75,081,874,642	44
▪ Secondary	449,086,385	4	11,241,005,664	93	344,070,754	3	12,034,162,803	7
▪ Technical/vocational	195,629,429	5	1,411,250,162	34	2,589,250,324	62	4,196,129,915	2
▪ Higher Ed.	647,755,292	3	5,664,096,648	26	15,498,052,465	71	21,809,904,404	13
▪ ECD	9,272,497,097	96.9	248,151,162	2.6	45,667,048	0.5	9,566,315,308	6
▪ Adult Ed.	387,915,622	29	613,304,512	46	339,143,381	25	1,340,363,515	1
▪ Special Ed.	306,440,072	30	595,373,499	59	106,143,802	11	1,007,957,372	1
▪ Other	6,062,169,520	14	21,058,033,498	48	17,033,579,178	39	44,153,782,196	26

Source: Brazilian National Treasury

Table 6.2: Public investment on Education per student Nominal prices - Brazil 2000 - 2008

	Total (all levels)	Basic Education	ECD	Elementary Education		Secondary Education	Tertiary Education
				Early years	Late years		
2000	970	808	924	794	811	770	8.927
2001	1.082	902	898	845	951	944	9.5
2002	1.214	1.005	952	1.111	1.032	747	10.135
2003	1.329	1.116	1.197	1.176	1.117	938	9.706
2004	1.513	1.284	1.372	1.359	1.374	939	10.573
2005	1.7	1.44	1.373	1.607	1.53	1.004	11.363
2006	2.042	1.773	1.533	1.825	2.004	1.417	11.82
2007	2.467	2.163	1.954	2.274	2.369	1.735	13.089
2008	2.995	2.632	2.206	2.761	2.946	2.122	14.763

Source: Inep/MEC

Table 6.3: Public investment on Education per students
Reais 2008 - Brazil 2000 - 2008

	Total (all levels)	Basic Education	ECD	Elementary Education		Secondary Education	Tertiary Education
				Early years	Late years		
2000	1.667	1.388	1.587	1.365	1.393	1.324	15.341
2001	1.726	1.439	1.433	1.349	1.518	1.506	15.161
2002	1.722	1.426	1.35	1.576	1.463	1.06	14.374
2003	1.724	1.448	1.553	1.526	1.45	1.217	12.594
2004	1.824	1.548	1.655	1.638	1.656	1.133	12.749
2005	1.94	1.643	1.566	1.833	1.746	1.146	12.965
2006	2.259	1.961	1.695	2.019	2.217	1.568	13.076
2007	2.612	2.291	2.069	2.408	2.509	1.837	13.861
2008	2.995	2.632	2.206	2.761	2.946	2.122	14.763

Source: Inep/MEC

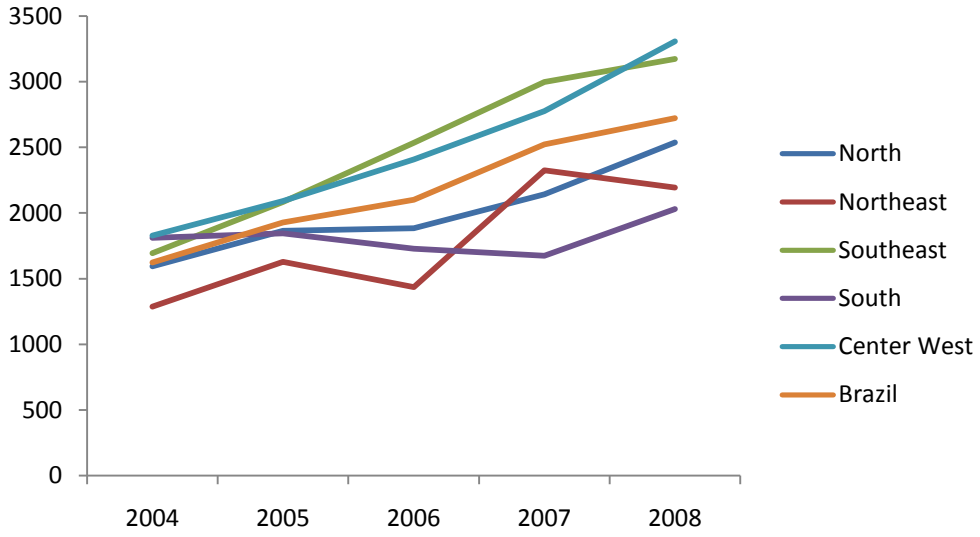
Table 6.4: Student per capita - Fundamental Education - Public system (Real Prices, base 2007) 1994/2007

	1994	1998	2002		2006		2007	
			Early Years	Late years	Early Years	Late years	Early Years	Late years
Brazil	**423.6**	**1,372.2**	**1,644.5**	**1,527.1**	**1,932.1**	**2,121.5**	**2,273.5**	**2,368.7**
North	**275.8**	**1,158.0**						
Rondônia	219.6	1,227.6	1,504.4	1,561.1	1,915.5	1,939.6	2,217.2	2,118.8
Acre	505.3	1,969.7	1,903.5	2,333.5	2,674.6	2,859.1	3,055.7	3,467.4
Amazonas	301.9	1,249.4	935.3	1,334.0	1,439.7	1,747.9	1,606.7	1,796.9
Roraima	439.8	2,120.5	2,855.9	3,415.0	3,267.2	3,410.5	3,915.9	4,194.3
Pará	235.4	979.7	781.3	1,125.8	963.3	1,030.0	1,503.8	1,453.5
Amapá	447.6	1,439.4	2,225.6	2,281.6	2,553.3	2,681.4	2,649.9	2,764.1
Tocantins	278.3	1,077.3	1,347.7	1,468.5	1,922.3	2,016.2	2,164.6	2,284.6
Northeast	**235.7**	**954.9**						
Maranhão	180.0	822.9	748.8	1,047.3	883.3	1,053.8	1,532.8	1,463.8
Piauí	235.3	923.3	962.0	1,182.4	1,286.8	1,373.2	1,345.2	1,456.3
Ceará	259.8	1,013.6	845.3	1,118.7	994.6	1,477.5	1,483.6	2,318.6
Rio Grande do Norte	261.8	1,354.5	1,204.2	1,567.5	1,708.0	1,837.7	1,947.2	2,057.4
Paraíba	250.6	901.2	1,004.7	1,213.0	1,227.6	1,429.9	1,541.2	1,633.1
Pernambuco	172.0	922.8	1,155.7	910.3	1,206.9	1,379.2	1,466.7	1,672.3
Alagoas	228.0	983.5	839.6	944.8	1,018.9	1,275.6	1,457.1	1,656.9
Sergipe	339.6	1,086.8	1,170.6	1,309.8	1,605.6	1,652.2	1,844.6	1,845.8
Bahia	255.6	924.0	938.5	1,167.9	1,111.8	1,379.9	1,500.8	1,646.4
Southeast	**520.5**	**1,643.7**						
Minas Gerais	398.9	1,535.2	1,555.5	1,591.8	1,817.4	1,815.5	2,007.2	1,885.0
Espírito Santo	518.6	1,777.6	1,574.2	1,321.0	2,406.1	2,608.4	2,691.8	2,764.7
Rio de Janeiro	597.6	1,800.4	1,949.3	2,171.9	2,909.9	3,866.3	3,024.9	3,941.7
São Paulo	573.0	1,644.0	2,856.4	1,949.1	3,344.1	3,283.6	3,671.3	3,432.7
South	**515.9**	**1,541.2**						
Paraná	480.9	1,576.6	1,859.6	1,836.6	2,190.2	1,957.4	2,280.3	2,833.3
Santa Catarina	498.9	1,267.6	1,799.0	1,505.3	1,964.1	2,055.0	1,915.4	1,864.3
Rio Grande do Sul	562.8	1,661.6	1,794.5	1,534.2	2,385.1	2,198.5	2,337.5	2,143.8
Center West	**381.8**	**1,722.8**						
Mato Grosso do Sul	381.5	1,506.6	1,517.8	1,528.6	2,180.0	2,200.8	2,706.9	2,763.9
Mato Grosso do Sul	305.5	1,392.9	2,289.4	1,437.4	2,263.2	1,997.6	2,541.8	2,284.7
Goiás	191.1	907.9	1,774.3	1,286.2	2,001.7	1,982.0	2,235.6	2,173.6
Distrito Federal	1,034.2	4,576.2	3,686.6	4,453.3	3,222.8	2,960.0	3,272.3	3,194.0

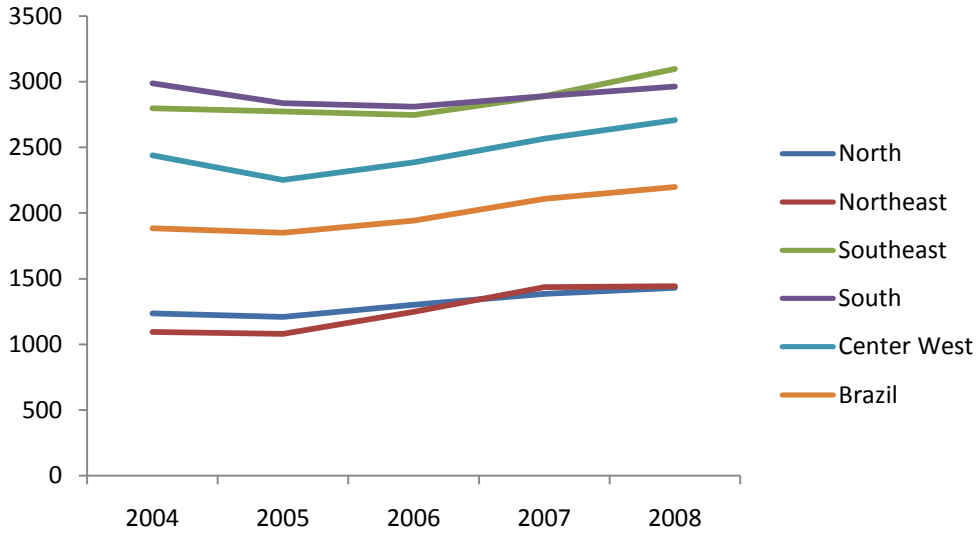
Source: IPEA/DISOC, IBGE/MP & INEP/MEC.

Table 6.5: Student per capita Expenditures 2004-2008 at State and Municipal Level disaggregated by region (real prices, base 2008)

State Level



Municipal Level



Source: Brazilian Financial data. Schools census of various years.
Elaboration: Author's

Table 6.6: Taxa de Matrícula Líquida no Ensino Fundamental

	1992	1993	1995	1996	1997	1998	1999	2001	2002	2003	2004*[1]	2005*[1]	2006*[1]	2007*[1]	2008*[1]
Brasil	81.4	83.0	85.5	86.6	88.6	91.0	92.5	93.4	93.9	94.0	94.0	94.6	95.0	94.6	94.9
Norte[1]	82.6	83.7	86.3	86.5	86.8	90.1	91.6	92.2	92.2	92.8	92.2	93.2	93.9	93.3	93.6
Acre	88.4	85.0	89.9	89.9	88.7	86.5	88.8	93.1	93.9	95.3	90.7	91.0	92.7	88.8	92.2
Amapá	93.8	86.9	90.2	92.7	90.2	94.8	95.6	96.1	91.8	94.5	94.4	95.8	95.6	93.5	94.6
Amazonas	82.8	81.7	84.9	85.7	84.0	89.2	91.1	91.9	92.1	91.8	93.9	94.8	94.9	94.1	94.4
Pará	82.3	84.6	84.9	85.6	86.5	88.8	91.0	92.0	92.4	92.5	91.1	92.0	93.0	92.9	93.0
Rondônia	87.7	87.9	90.2	89.3	89.3	93.2	94.7	92.7	92.9	93.6	92.8	93.8	93.7	92.7	93.3
Roraima	95.4	95.4	96.9	95.4	89.6	93.1	97.5	94.4	83.0	94.1	95.5	95.5	95.0	94.2	93.3
Tocantins	73.2	78.2	85.7	83.9	88.2	92.3	90.3	91.7	92.6	93.2	92.5	93.8	95.3	95.6	95.9
Nordeste	69.7	72.7	76.1	78.0	81.9	86.7	89.2	90.7	91.6	91.7	91.7	92.5	93.6	93.7	94.3
Alagoas	64.8	69.5	67.6	70.5	77.1	81.0	84.7	90.6	91.4	89.7	91.3	94.2	92.7	93.6	93.6
Bahia	69.0	70.9	75.8	80.0	81.7	85.5	90.0	90.5	91.3	91.6	89.9	91.9	93.5	93.6	94.0
Ceará	66.4	67.6	71.0	75.8	83.9	88.8	90.6	91.9	92.6	91.9	93.7	92.9	94.6	94.8	95.0
Maranhão	63.8	70.5	72.7	72.4	75.9	84.5	85.0	86.6	88.1	86.5	88.8	88.7	91.7	91.8	94.1
Paraíba	69.4	73.0	77.4	77.6	83.3	88.2	92.5	93.2	93.2	95.4	94.1	93.6	93.8	93.8	95.9
Pernambuco	75.6	77.4	80.8	81.5	83.0	88.0	89.1	90.0	92.5	92.6	92.8	93.6	93.3	93.9	93.0
Piauí	71.2	78.2	79.4	76.8	82.7	87.8	89.1	93.1	92.7	94.3	93.1	93.1	95.3	94.2	94.9
Rio Grande do Norte	78.5	79.2	85.5	85.6	87.6	89.6	93.0	93.5	93.9	95.6	94.7	95.4	94.4	95.3	96.1
Sergipe	77.9	81.0	83.9	82.9	87.0	90.0	90.5	91.2	91.4	94.1	92.2	93.6	94.8	93.1	95.3
Centro-Oeste	85.9	85.6	88.1	89.8	90.5	93.1	93.6	94.7	93.9	94.0	94.5	94.9	95.5	94.8	94.5
Distrito Federal	92.2	92.6	92.9	93.9	94.8	95.5	94.8	95.2	93.6	93.7	95.6	94.7	94.5	94.9	95.9
Goiás	83.3	83.2	85.9	88.5	89.7	91.8	93.9	94.4	94.2	94.4	94.1	94.9	95.9	95.4	94.3
Mato Grosso do Sul	87.2	84.7	87.6	90.3	89.9	92.9	93.3	95.4	95.0	96.1	96.4	95.9	96.2	95.5	95.6
Mato Grosso	85.0	85.4	89.2	88.9	89.3	94.2	92.2	94.1	92.6	91.9	92.8	94.1	94.9	92.9	92.8
Sudeste	88.1	89.2	91.0	91.2	92.3	93.2	94.2	94.8	95.2	95.3	95.5	96.0	95.8	95.4	95.7
Espírito Santo	87.7	83.1	87.2	89.4	91.6	91.1	93.2	93.5	94.0	94.9	95.1	92.9	95.5	94.0	96.0
Minas Gerais	84.0	85.3	88.6	89.4	91.9	92.8	94.3	94.9	95.7	96.0	96.0	96.0	94.7	94.9	95.5
Rio de Janeiro	85.8	87.9	89.3	88.6	88.7	90.2	92.1	91.4	92.3	92.6	92.3	93.8	93.7	94.0	93.5
São Paulo	91.1	92.3	93.3	93.3	93.9	94.8	94.9	96.1	96.1	96.0	96.4	97.0	97.2	96.3	96.6
Sul	86.9	88.6	90.3	92.2	93.3	94.2	95.2	95.5	95.9	95.8	95.6	96.1	96.2	95.3	95.2
Paraná	85.3	86.2	89.3	90.9	92.6	93.9	94.0	95.2	96.2	95.2	95.4	95.8	95.8	94.2	95.2
Rio Grande do Sul	88.7	90.6	91.0	92.9	93.7	94.5	95.6	95.0	95.4	95.8	95.4	96.0	96.1	95.5	95.7
Santa Catarina	86.6	89.4	91.1	93.3	93.8	94.3	96.4	96.8	96.4	97.3	96.5	96.9	97.3	96.8	94.4

Fonte: Pesquisa Nacional por Amostra de Domicílios (PNAD).
Obs.: A pesquisa não foi a campo em 1994 e 2000.
Notas:
1 - A área rural da região norte do país, a exceção do estado de Tocatins passou a integrar a amostra em 2004.
Os resultados da coluna 2004*, 2005*, 2006*, 2007* e 2008* foram estimados incorporando a amostra da área rural da região norte.
2 - O indicador considera as pessoas de 7 a 14 anos frequentando o ensino fundamental sobre a população de 7 a 14 anos.

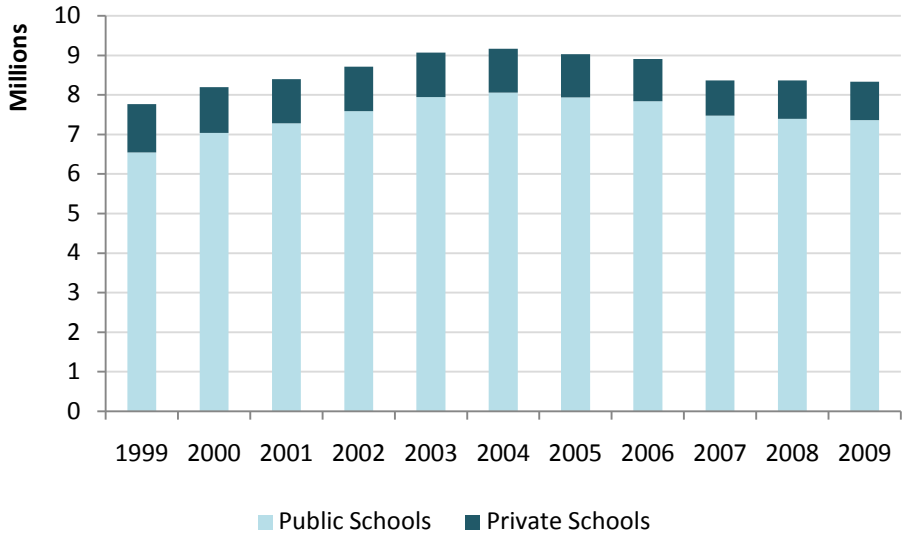
Table 6.7: FUNDEB: Students per capita by educational level - 2009

Education levels	Coefficient	National Minimum	R$/Student
ECD			
Creche			
Public - Full time	1.1		1485.099
Public - Partial time	0.8		1080.072
Conveniada - Full time	0.95		1282.5855
Conveniada- Partial time	0.8		1080.072
Preschool			
Full time	1.15		1552.6035
Partial time	0.9		1215.081
Elementary Education			
Early years (urban areas)	1		1350.09
Early years (rural areas)	1.05		1417.5945
Late years (urban areas)	1.1	1350.09	1485.099
Late years (rural areas)	1.15		1552.6035
Full time education	1.25		1687.6125
Secondary Education			
Urban	1.2		1620.108
Rural	1.25		1687.6125
Full time education	1.3		1755.117
Integrated technical/vocational education	1.3		1755.117
Special Education	1.2		1620.108
Indigenous Education and Quilombolas	1.2		1620.108
Adult and Youth education			
With process evaluation	0.7		945.063
Integrated technical/vocational education	0.7		945.063

Table 6.8: Public Expenditures in Education by government level - 2000/2009
(In Billions of Reais - 2009)

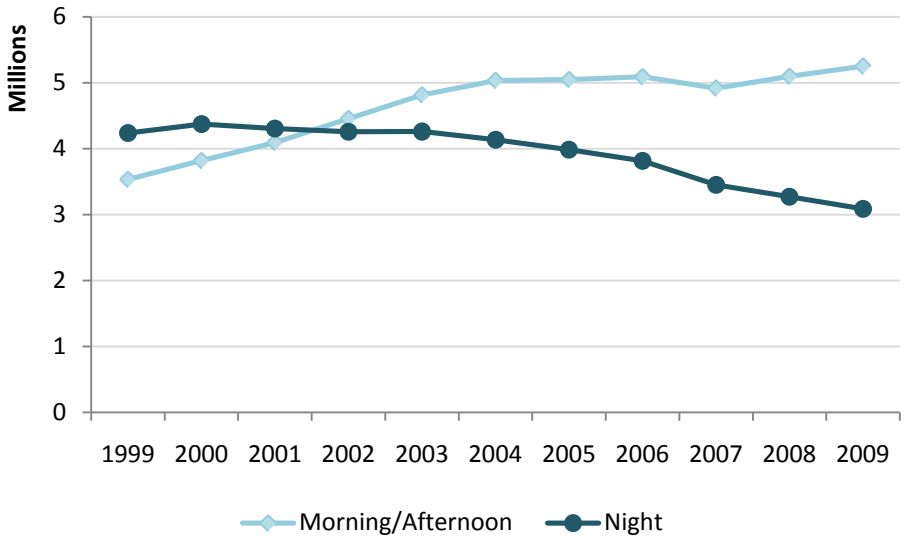
	Municipalities	States	Federal	Total
2009	62	71	37	169
2008	57	70	26	153
2007	53	61	24	138
2006	42	58	21	121
2005	37	54	20	112
2004	37	53	20	109
2003	41	57	21	118
2002	33	39	22	94
2001	35	60	22	117
2000	35	56	21	112
1998	35	53	34	122
1996	52	45	25	121

Table 6.9: Evolution of overall secondary enrollments in public and private institutions



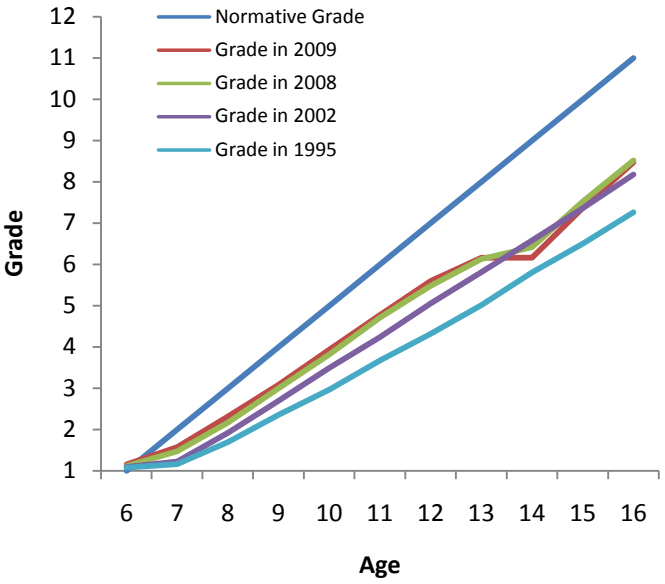
Source: MEC/Inep

Table 6.10: Evolution of secondary enrollments by school shift



Source: INEP/MEC

Table 6.11: Grade attainment of enrolled persons by age



Notes: For individuals of 6 and 16 years old who are currently enrolled in an Ensino Regular program

Table 6.12: State Schools: Evolution of share in enrollment in Night Shifts and IDEB, 2005, 2007, 2009

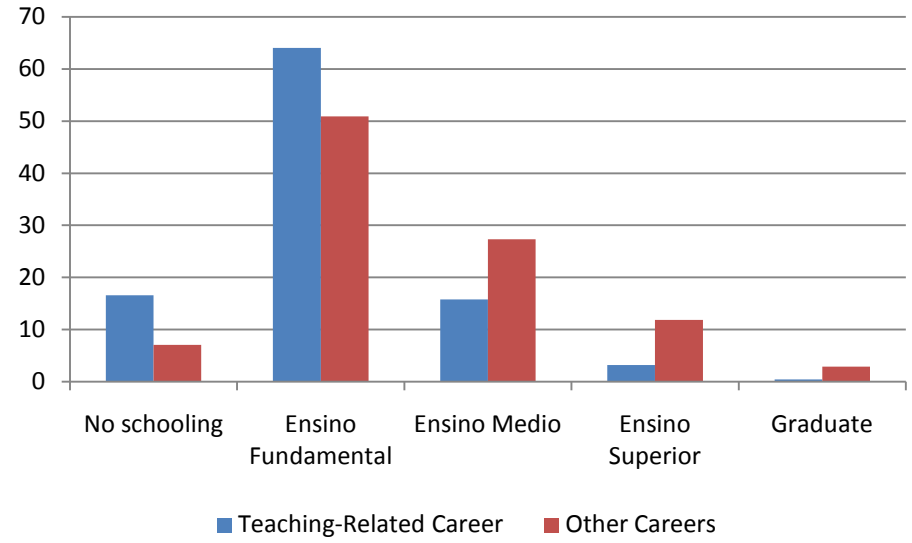
State	Share of Enrollment at Night Shifts				IDEB 2005 (N x P)	IDEB 2007 (N x P)	IDEB 2009 (N x P)
	2005	2007	2009	Diff.			
Tocantins	61%	52%	36%	-25%	2.9	3.1	3.3
Distrito Federal	32%	27%	17%	-15%	3.0	3.2	3.2
Paraíba	50%	42%	35%	-14%	2.6	2.9	3.0
Minas Gerais	52%	46%	39%	-13%	3.4	3.5	3.6
Mato Grosso	54%	45%	41%	-13%	2.6	3.0	2.9
Mato Grosso do Sul	50%	44%	38%	-12%	2.8	3.4	3.5
Alagoas	60%	55%	49%	-11%	2.8	2.6	2.8
Pará	57%	49%	46%	-11%	2.6	2.3	3.0
Rondônia	45%	39%	34%	-11%	3.0	3.1	3.7
Acre	35%	28%	24%	-11%	3.0	3.3	3.5
Piauí	67%	61%	57%	-10%	2.3	2.5	2.7
Rio de Janeiro	51%	47%	41%	-10%	2.8	2.8	2.8
Santa Catarina	50%	45%	40%	-10%	3.5	3.8	3.7
Espírito Santo	40%	35%	30%	-9%	3.1	3.2	3.4
Rio Grande do Norte	58%	54%	48%	-9%	2.6	2.6	2.8
Sergipe	60%	55%	51%	-9%	2.8	2.6	2.9
Roraima	30%	25%	21%	-9%	3.2	3.1	3.5
Pernambuco	59%	55%	51%	-8%	2.7	2.7	3.0
Ceará	44%	41%	36%	-8%	3.0	3.1	3.4
Rio Grande do Sul	42%	38%	34%	-8%	3.4	3.4	3.6
Amazonas	59%	55%	51%	-7%	2.3	2.8	3.2
Goiás	49%	47%	42%	-7%	2.9	2.8	3.1
Maranhão	56%	54%	51%	-6%	2.4	2.8	3.0
Amapá	49%	47%	44%	-5%	2.7	2.7	2.8
Bahia	42%	40%	37%	-5%	2.7	2.8	3.1
Paraná	44%	43%	39%	-5%	3.3	3.7	3.9
São Paulo	46%	45%	44%	-3%	3.3	3.4	3.6
Brasil	49%	46%	42%	-8%	3.0	3.2	3.4

Source: Censo Escolar 2005, 2007 and 2009

Note: Night Shift considered all classes that start at 5pm or later (according to INEP definition)

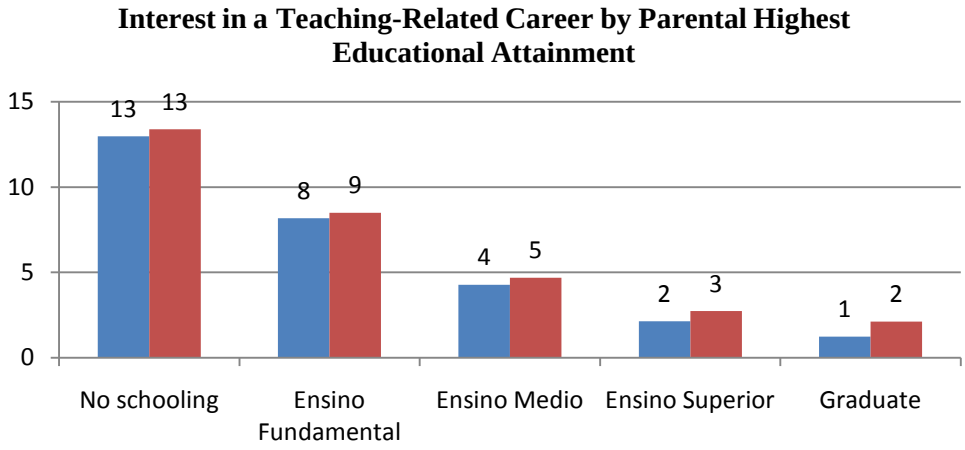
Enrollment and IDEB figures are for students in Ensino Medio in State (Estadual) Schools

Graph 1: Parental (Father) Educational Achievement by Career Path Chosen



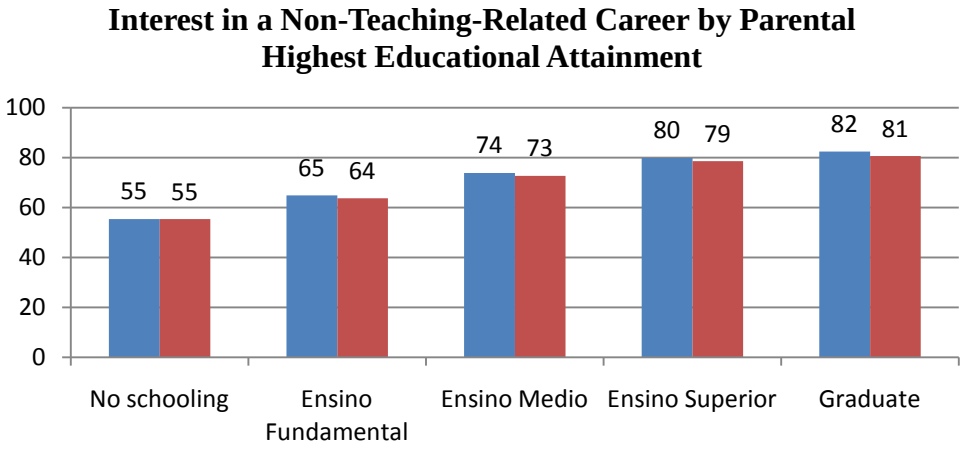
Source: ENEM 2008
Base on table 1

Graph 2: Interest in an Education-Related Career according to Parental Educational Achievement



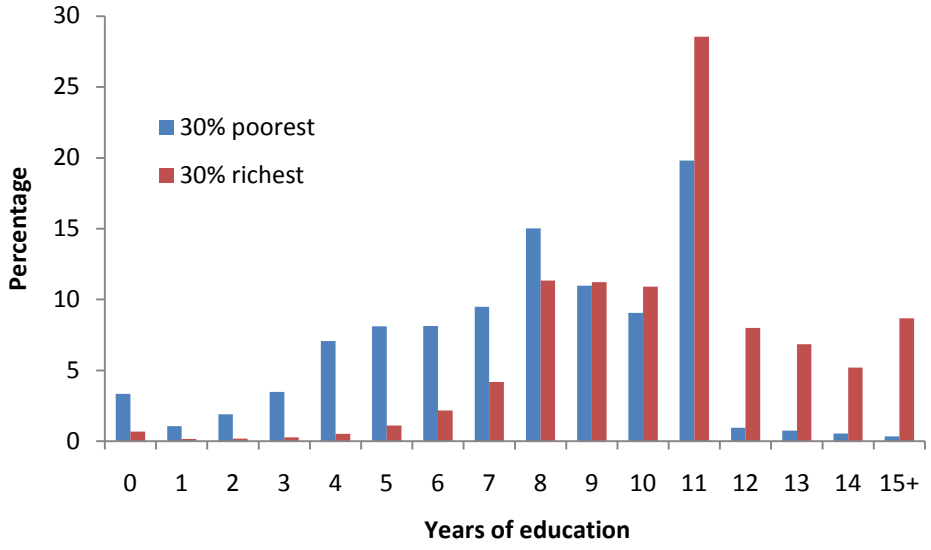
Source: ENEM 2008
Base on table 2

Graph 3: Interest in an Non-Education-Related Career according to Parental Educational Achievement



Source: ENEM 2008
Base on table 2

Brazil: Distribution of years of education according to Household Income Poverty, 2009



Source: PNAD 2009

Notes: For population of ages between 15 and 25 years old who still live with their parents

Table 6.13: SAEB/Prova Brasil Scores: Percentage improvement in Brazilian Basic Education in State Schools (public and private) - 2005/2009

States	4th Grade				8th Grade				3rd Grade Secondary Education			
	Math		Portuguese		Math		Portuguese		Math		Portuguese	
	2005/2009	2007/2009	2005/2009	2007/2009	2005/2009	2007/2009	2005/2009	2007/2009	2005/2009	2007/2009	2005/2009	2007/2009
Acre	13.7	5.6	7.0	4.8	4.7	0.4	4.9	5.4	4.7	0.3	7.8	3.2
Alagoas	12.8	1.6	8.5	1.6	4.8	1.2	6.9	4.7	-1.9	4.0	3.9	5.2
Amapá	10.9	3.5	5.7	2.7	0.7	-1.3	2.9	2.8	0.6	2.8	4.3	4.2
Amazonas	12.8	4.8	9.7	4.2	7.4	-0.5	9.7	4.1	6.2	2.7	10.4	6.4
Bahia	14.2	3.6	12.0	3.0	3.0	-0.2	2.6	3.0	2.9	2.6	10.3	6.3
Ceará	23.6	7.8	14.7	7.7	5.9	1.7	9.2	6.1	1.7	0.4	3.1	2.4
Distrito Federal	9.8	6.9	6.8	5.2	0.6	-0.4	2.3	2.1	-6.5	-7.7	-1.0	-5.5
Espírito Santo	11.7	6.7	7.6	5.6	2.8	1.1	6.7	4.9	3.2	5.9	5.4	8.8
Goiás	12.4	8.6	8.5	8.7	4.5	0.3	5.2	4.5	2.9	2.4	6.1	6.0
M. G. do Sul	13.8	4.5	11.0	4.3	6.1	1.4	6.7	5.8	4.4	3.7	5.8	6.1
Maranhão	15.7	0.9	8.7	1.9	4.6	0.3	4.8	3.9	5.4	0.7	9.4	3.2
Mato Grosso	14.7	5.3	10.8	5.1	6.7	1.5	8.2	6.1	0.0	-0.9	1.6	2.2
Minas Gerais	11.8	11.9	8.8	10.6	3.8	2.3	6.8	5.3	-1.0	-1.1	2.7	-0.9
Pará	13.2	4.0	6.9	3.9	-0.3	-2.2	0.1	2.2	6.1	5.1	8.6	8.6
Paraíba	14.2	4.7	9.9	4.8	5.6	1.7	5.8	4.6	4.0	0.5	9.5	4.0
Paraná	10.3	6.9	7.9	5.1	5.0	-0.4	9.0	4.1	3.0	0.9	6.0	4.4
Pernambuco	13.4	4.0	7.9	3.5	5.3	2.6	7.5	5.7	2.3	0.4	2.8	4.1
Piauí	23.2	5.7	13.6	5.6	7.1	1.6	7.9	5.3	2.0	1.3	2.9	4.0
R. G. do Norte	21.8	8.1	16.1	9.2	6.9	1.3	7.7	4.5	2.3	1.3	7.6	3.8
R. G. do Sul	10.9	5.2	5.9	4.4	1.1	2.2	3.4	4.1	-0.2	4.3	2.8	3.6
Rio de Janeiro	7.3	5.7	4.8	4.9	4.2	2.7	5.3	4.7	2.9	1.2	4.7	2.6
Rondônia	12.7	5.2	7.0	4.2	0.0	-0.6	2.0	4.0	3.8	3.5	7.2	6.9
Roraima	8.9	0.1	5.0	-0.2	2.3	-2.3	3.6	2.1	-0.7	3.7	2.3	5.5
Santa Catarina	11.8	4.2	6.4	3.3	3.1	1.5	2.1	4.9	-0.4	-2.3	3.0	0.7
São Paulo	15.0	8.1	7.1	6.1	3.4	-0.5	3.7	3.0	3.4	0.5	5.9	2.8
Sergipe	10.9	4.2	7.8	3.8	0.8	1.9	2.0	4.8	0.2	4.8	2.8	8.8
Tocantins	16.6	5.8	9.8	4.8	6.3	0.3	7.4	4.6	3.0	1.5	6.8	3.7

Source:
MEC/INEP.

Table 6.14: SAEB/Prova Brasil Scores: Percentage of improvement in Brazil Basic Education in State Schools (public and private) - 2005/2009

States	4th Grade				8th Grade				3rd Grade Secondary Education			
	Math		Portuguese		Math		Portuguese		Math		Portuguese	
	2005/2009	2007/2009	2005/2009	2007/2009	2005/2009	2007/2009	2005/2009	2007/2009	2005/2009	2007/2009	2005/2009	2007/2009
Acre	17.0	7.4	11.1	7.3	5.9	1.7	5.8	6.6	4.66	0.30	7.77	3.21
Alagoas	6.4	0.2	1.7	0.3	1.8	0.6	5.5	4.5	-1.87	4.02	3.90	5.19
Amapá	14.1	6.0	9.2	5.5	1.2	0.4	3.9	4.5	0.57	2.84	4.27	4.23
Amazonas	16.5	8.0	14.6	6.7	9.7	1.2	12.1	5.6	6.19	2.74	10.44	6.41
Bahia	11.2	4.2	6.1	4.2	1.7	-0.2	0.7	2.7	2.91	2.61	10.31	6.33
Ceará	21.7	6.1	10.7	8.6	9.0	1.8	13.6	6.8	1.74	0.43	3.07	2.44
Distrito Federal	11.4	7.0	8.5	5.1	0.4	-0.5	2.8	2.5	-6.55	-7.74	-0.97	-5.52
Espírito Santo	14.0	8.3	5.5	6.0	-0.6	1.0	6.0	4.8	3.15	5.90	5.44	8.79
Goiás	15.7	9.2	14.3	9.5	3.9	-0.4	4.3	4.3	2.87	2.41	6.10	6.02
M. G. do Sul	14.3	6.8	11.5	6.4	6.2	1.0	6.6	5.5	4.40	3.69	5.80	6.08
Maranhão	10.3	1.9	2.8	1.9	3.1	0.2	4.6	4.4	5.44	0.65	9.39	3.16
Mato Grosso	13.2	4.4	10.3	4.2	5.6	1.5	8.2	6.5	0.04	-0.91	1.57	2.24
Minas Gerais	10.1	11.4	8.5	9.2	2.9	2.3	7.1	5.8	-0.96	-1.09	2.75	-0.89
Pará	12.4	4.3	4.5	4.9	1.0	-0.8	0.6	3.7	6.12	5.08	8.58	8.64
Paraíba	12.9	3.5	7.7	3.4	4.9	0.5	4.1	3.7	4.01	0.46	9.46	4.02
Paraná	5.3	3.8	1.7	3.2	5.3	-0.6	10.4	4.5	3.01	0.86	6.02	4.41
Pernambuco	13.9	4.7	9.7	2.9	5.6	2.4	7.2	5.8	2.35	0.36	2.82	4.12
Piauí	19.2	7.1	17.3	7.0	6.7	0.6	7.2	5.2	1.99	1.27	2.94	4.03
R. G. do Norte	17.5	7.5	15.7	8.9	6.2	0.8	8.1	4.6	2.34	1.29	7.64	3.84
R. G. do Sul	8.2	5.6	4.8	4.5	2.1	2.2	4.8	4.2	-0.24	4.29	2.80	3.63
Rio de Janeiro	10.0	3.7	2.1	2.9	8.1	3.0	5.3	5.4	2.87	1.19	4.74	2.58
Rondônia	16.2	7.1	8.8	6.2	3.5	0.5	4.5	5.0	3.80	3.47	7.18	6.88
Roraima	10.2	0.4	5.9	0.0	6.2	-0.8	6.2	3.6	-0.71	3.70	2.31	5.54
Santa Catarina	7.9	2.6	2.5	2.1	2.0	0.7	0.9	4.3	-0.36	-2.34	3.00	0.69
São Paulo	16.5	9.9	6.5	7.2	5.4	0.1	5.2	3.6	3.38	0.48	5.93	2.77
Sergipe	9.6	3.6	3.4	2.5	-1.0	0.9	0.9	4.2	0.22	4.79	2.81	8.85
Tocantins	13.9	5.3	9.4	4.7	6.8	1.0	7.3	5.2	3.03	1.53	6.77	3.71

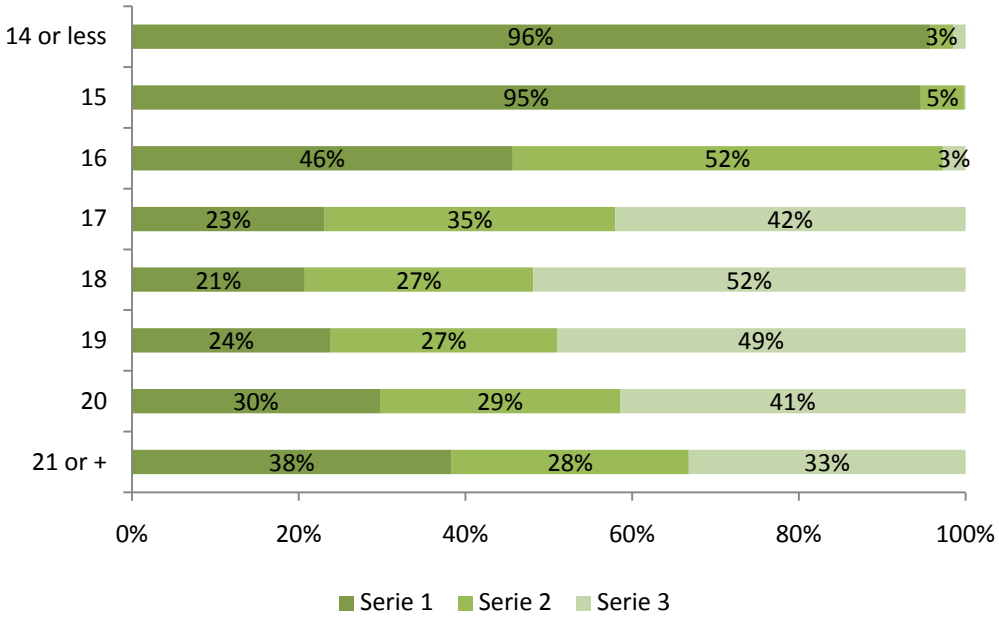
Source:
MEC/INEP.

Table 6.15: Age-Grade Distorsion in Ensino Medio 2008

	Serie 1	Serie 2	Serie 3
14 or less	96%	3%	1%
15	95%	5%	0%
16	46%	52%	3%
17	23%	35%	42%
18	21%	27%	52%
19	24%	27%	49%
20	30%	29%	41%
21 or +	38%	28%	33%

Source: Censo Escolar 2008
Note: Figures include enrollment Series 1, 2, and 3 in Ensino Medio, Ensino Medio Integrado, and Ensino Medio Normal/Magistério. Enrollment figures in "No Seriado" classes are excluded.

Age-Grade Distorsion in Ensino Medio, 2008



Age-Grade Distorsion in Ensino Medio State Schools, 2008

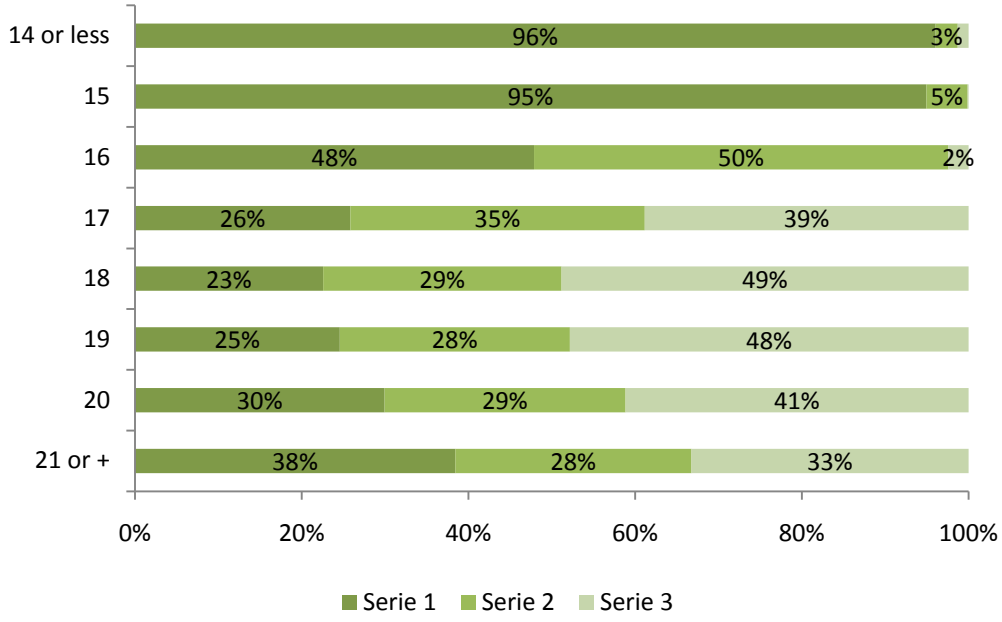


Table 6.16: Brazil, 2008: Schools with Dropout rates set at various thresholds in Ensino Medio Public schools by State

State	All Schools			Public Schools			Private Schools		
Threshold	40%	50%	60%	40%	50%	60%	40%	50%	60%
Rondônia	60.9	44.1	21.8	68.5	50.3	24.8	23.3	13.3	6.7
Acre	38.2	26.5	16.2	42.1	29.8	19.3	18.2	9.1	0.0
Amazonas	41.6	22.1	8.5	42.7	21.8	8.4	35.7	23.8	9.5
Roraima	45.4	23.7	13.4	45.1	24.2	13.2	50.0	16.7	16.7
Pará	34.3	19.4	9.1	35.9	19.1	9.2	28.6	20.6	8.7
Amapá	53.0	44.6	18.1	57.8	50.7	21.1	25.0	8.3	0.0
Tocantins	39.8	21.7	10.6	42.1	22.3	11.2	14.3	14.3	4.8
Maranhão	40.8	24.7	14.0	45.8	27.1	15.4	15.4	12.3	6.9
Piauí	42.4	23.9	11.9	48.4	27.6	14.1	18.5	9.3	2.8
Ceará	41.6	22.9	7.9	46.3	25.0	8.6	30.6	17.8	6.4
Rio Grande do Norte	32.4	14.1	5.4	34.6	14.0	5.6	26.2	14.6	4.9
Paraíba	34.4	20.7	9.0	38.7	23.2	10.1	22.2	13.7	6.0
Pernambuco	34.0	21.0	9.1	39.7	25.3	10.9	19.7	10.6	4.6
Alagoas	34.3	19.4	9.7	37.0	21.0	11.1	29.1	16.3	7.0
Sergipe	37.8	20.9	9.7	46.5	25.6	12.4	20.9	11.9	4.5
Bahia	33.1	19.2	7.7	35.1	19.8	7.6	26.4	17.5	7.9
Minas Gerais	29.1	15.0	6.2	32.8	16.5	6.7	16.9	9.9	4.6
Espírito Santo	35.3	19.0	8.4	41.8	22.2	8.7	21.5	12.3	7.7
Rio de Janeiro	43.4	26.4	11.8	53.9	32.2	13.9	28.5	18.2	8.9
São Paulo	31.7	17.1	6.9	38.9	20.7	8.0	16.7	9.6	4.7
Paraná	28.7	14.9	5.9	29.5	14.6	5.9	25.7	16.3	6.0
Santa Catarina	31.1	17.5	6.1	35.6	19.7	6.9	15.1	9.7	3.2
Rio Grande do Sul	55.2	37.0	20.2	66.5	45.6	25.6	18.5	8.9	2.7
Mato Grosso do Sul	48.6	31.0	10.7	57.4	35.0	12.6	20.7	18.4	4.6
Mato Grosso	34.0	18.2	10.0	39.3	20.9	11.5	15.1	8.5	4.7
Goiás	26.7	12.6	4.4	29.9	13.0	4.4	18.7	11.6	4.4
Distrito Federal	27.1	15.9	6.5	28.0	18.7	8.0	26.3	13.7	5.3
Brasil	**35.5**	**20.2**	**8.9**	**40.9**	**23.0**	**10.1**	**21.0**	**12.7**	**5.6**

Source: Censo Escolar 2008