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Patterns of Privilege: School Inputs in Brazil

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Patterns of Privilege: School Inputs in Brazil

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Abstract

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Brazil's *Bolsa Família* and its impacts on student enrollment and achievement is studied increasingly frequently, but the quality of education received by *Bolsa Família* recipients is often not factored in. This study uses school data and the *Bolsa Família* registry to map patterns of school inputs for all Brazilian students, and to discover any patterns in inputs for specifically *Bolsa Família* recipient students. The availability of all types of school inputs follow similar regional patterns: low quantities of materials and low quality facilities in the North and Northeast regions, and the reverse in the South and Southeast, with the most consistently high averages of all inputs found in the Central-West. High proportions of these students tend to be present in the North and Northeast, affecting their access to school inputs. These students also tended to lack infrastructure and technology inputs, which likely have a mixed impact on student performance.

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Chapter 1: *Introduction*

Education is widely regarded as the key to development for poorer populations and for less developed nations. Increasing levels of education among members of a population creates human capital, which contributes to economic success, and can also increase productivity. However, education's benefits go beyond the economic – increased education carries positive effects on health, nutrition, equality, and other social indicators.[1] As such, education is a key focus of many governments' budgets. In 2007, average spending on education as a percentage of total government spending was 15.2%. In Latin America, education as a percentage of total government spending ranges from 11% in the Dominican Republic to 20.6% in Cuba.[2]

Things are no different in Brazil. Education has been an emphasis of presidential platforms and government programs since the 1920s, to the point that in 1945 President Getúlio Vargas had "*A escola é material da salvação pública"* (The school is the means of our salvation) inscribed in the entryway of the building housing the Ministry of Education. Brazil's ambitious and all-encompassing social program *Bolsa Família* carries on this legacy by making education the focal point of one of the program's components intended to reduce poverty and inequality across the country. Families with children in school receive cash transfers to cover the cost of essentials so that children may stay in

[1]David N. Plank, *The Means of Our Salvation: Public Education in Brazil, 1930-1995*, (Boulder, CO: Westview Press, 1996), 4.
[2] "World Bank: Data Catalog," accessed Nov 15, 2011, http://data.worldbank.org.

school, with the assumption that greater education will reduce long-term vulnerability and poverty.[3]

WHY STUDY CONDITIONAL CASH TRANSFERS?

Brazil's *Bolsa Família* program inspires enthusiasm – and devotion – in scholars and policymakers alike for its innovative approach to combating both the symptoms and roots of poverty and inequality through conditional cash transfers. The World Bank's webpage on *Bolsa Família* is glowingly titled "Changing the Lives of Millions in Brazil."[4] A number of the most prominent international development organizations began studying the food components of the program immediately after President Luíz "Lula" da Silva's announcement of *Fome Zero*'s launch.[5] The United Nations' Food and Agriculture Organization released a report in 2009 recommending that other nations follow Brazil's example in their own program design.[6] Countless other articles sing the program's praises, even as they count some of its drawbacks. In general, *Bolsa Família*'s success in reaching a large number of Brazil's poor while limiting spending and improving targeting and efficiency has many people very excited about conditional cash transfers.

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[3] "*Bolsa Família*," Ministério do Desenvolvimento Social e Combate à Fome, http://www.mds.gov.br/bolsafamilia.

[4] "*Bolsa Família*: Changing the Lives of Millions in Brazil," World Bank, http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/LACEXT/BRAZILEXTN/0,,contentMDK:21447054~pagePK:141137~piPK:141127~theSitePK:322341,00.html.

[5] Joint FAO/IDB/WB/Transition Team Working Group, "Projeto Fome Zero," http://www.fao.org/righttofood/KC/downloads/vl/docs/AH192.pdf.

[6] FAO Regional Office for Latin America and the Caribbean, "A Reference for Designing Food and Nutrition Security Policies: The Brazilian Fome Zero Strategy," October 2009.

And it is not just Brazil. In 1997, only three countries had conditional cash transfer programs: Brazil, Mexico, and Bangladesh. In 2008, at least 30 countries had conditional cash transfer programs, 17 of which were in Latin America and the Caribbean.[7] Mexicos' program in particular, Progresa/Oportunidades, has been in place in rural areas since 1997 and nationwide since 2002, and has had significant impacts on nutrition, education, and health. Clearly, conditional cash transfer programs are here to stay, and as such, the study of *Bolsa Família*'s impacts is important.

WHY STUDY EDUCATION IN THE FRAMEWORK OF FEDERAL SPENDING?

Studying education in the framework of federal spending is important, especially for countries like Brazil where investment in education forms a major part of the drive to create human capital and economic growth. Brazil should consider whether federal spending is increasing not just quantity, but also quality of schooling, and whether increases in years of education without comparative increases in employment opportunities, or educational inflation, is damaging lower classes' economic prospects.

Human Capital, Economic Development, and Opportunity Costs

Education, as one of the key elements of the process of creating human capital, is regarded as an essential part of economic and social development. A country without an educated workforce is limited in its economic growth, due to low productivity of uneducated workers and the labor force's inability to accommodate new and modern industries or production techniques. Nowhere was the existence of human capital's

[7] Ariel Fiszbein et al., "Conditional Cash Transfers: Reducing Present and Future Poverty" (Washington D.C.: World Bank, 2009), 4-5.

impact on economic growth more apparent than in Asia, where the East Asian "tiger" governments achieved rapid and extensive development between the 1960s and 1990s through federal investments in education and health, while other Asian countries were left behind. This investment in human capital created a climate that encouraged foreign investment and a workforce that was able to adapt to new technologies and industries, increasing production and creating economic growth.[8]

A 1994 review of studies on returns to education found similar evidence of education's economic importance, on a national and an individual level. Primary school garners the highest returns to education, and returns vary depending on a country's per capita income, the industry in which an individual works, quality of education received, and a variety of other factors. However, there is a consistent and positive correlation between more years of education and higher earnings across all regions of the world. In some countries, education can also be shown to be connected with higher productivity, even among agricultural workers. Clearly, education is important both for country-wide development as well as for individual socioeconomic development.[9]

Investment in education and by extension human capital, however, is not enough to guarantee an increase in national economic growth and individual economic improvement. A by-product of investment in education can be educational inflation, or surplus schooling. The argument can be made that there can be no such thing as over-schooling, or having too much education for the job held, and that everyone is educated

[8] UNESCAP, "The Role of Human Capital in Economic Development: Some Myths and Realities," *Development Planning in a Market Economy: LDC Series* 6 (2001): 5, 7.
[9] George Psacharopoulos, "Returns to Investment in Education: A Global Update," *World Development* 22.9 (1994), 1326-1330, 1333.

exactly as much as they would like to be, according to how much they personally value education.[10] However, a counter-argument presents itself: that the opportunity cost of education is high on the individual level for impoverished families, and that over-schooling at the regional or national level can produce educational inflation, which pushes down the overall returns to education.[11]Although these costs are balanced out by the funds received through *Bolsa Família*, a low-quality education can still make schooling costly by limiting future returns.

Educational inflation

Educational inflation has created several different outcomes in Brazil specifically, all of which put lower class students and workers at an even greater disadvantage than before. This is also a problem in that there is a mismatch between the emphasis on education, especially the higher levels, and the actual jobs available. In 2004, more than two-thirds of the jobs available did not require more than a primary education. One disadvantage that over-schooling has created is a situation in which to reach even low wage levels requires more years of schooling than were required before, which means that poor and rural students who generally do not complete as many years of schooling are at a disadvantage. In 1992, "it took about 7-8 years of schooling to reach the national mean wage, [while] in 2001 it took about 10-11 years to do so."[12]

[10] Ibid, 1334.
[11] João Batista a Araújo e Oliveira, "Expansion and Inequality in Brazilian Education," in *The Challenges of Education in Brazil*, edited by Colin Brock and Simon Schwartzman (Symposium Books, 2004), 50.
[12] Oliveira, "Expansion and Inequality," 47-48.

Another disadvantage is that the signaling effects of educational attainment are canceled out in part by the surplus of education in the market. Wage increases for those completing eighth or eleventh grade dropped in recent years, although there is still a slight increase with greater educational attainment. Finally, although there is still a consistent positive correlation between more education and higher wages, that effect has been greatly diminished in such a way that significant wage gains do not occur until a worker has gotten university education. All of these factors combine to create a situation in which those with a primary education and those with a university education fare the best in the job market – those in between, despite the fact that they have more education than those with partial or complete primary educations, have invested more than they will get back out of their jobs.[13]

Educational inflation also may be a contributing factor in the problem of low efficiency and quality in the Brazilian public school system. Rapidly expanding enrollments paired with an inability to offer a competitive salary means either a shortage of teachers and staff or an influx of unqualified teachers, as was discussed in the prior section. Lack of adequate targeting with the government budget also means that while the poor are now able to attend schools, much of per capita educational spending is for those attending university and inequities in the system persist despite inclusion. Overall, inequities and inflation result in a system in which the poor struggle to finish schooling, and often collect relatively less returns for their effort.[14]

[13] Ibid, 50.
[14] Ibid, 51-54.

Brazil's Federal Spending on Education

Since the Cardoso administration, Brazilian federal spending on education has expanded through various programs, intended to equalize school equipment and teacher training so that low SES students could have better educational opportunities.[15] *Bolsa Família* and its precursor *Bolsa Escola* have had a positive effect on enrollment and grade promotion, including progress in equalizing the racial composition of enrollment, and decreased the drop-out rate.[16] These signs of progress are extremely positive, as they tie into the *Bolsa Família*'s original intentions to achieve greater equality and broader access to education. The question remains, however, whether this federal spending and the increase in enrollment due to *Bolsa Família* has resulted in expanded educational opportunities to positively affect Brazilian children's future.

RESEARCH QUESTION AND FINDINGS

This study intends to begin looking primarily into the quality of education received by *Bolsa Família* students by studying patterns of school inputs for all schools in Brazil, then considering patterns of school inputs for schools with high percentages of *Bolsa Família* recipient students. This study is possible through a matched database of Brazil's *Cadastro Único*, the unified registry used to enroll families in welfare programs and other government programs, and *Educacenso,* the yearly nationwide educational census conducted by the government. The broader *Educacenso* database is also used, to allow for the study of national patterns in all schools, with all students.

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[15] Martin Carnoy, et al., *Cuba's Academic Advantage: Why Students in Cuba Do Better in School* (Stanford, CA: Stanford University Press, 2007), 20-22.

[16] Paul Glewwe and Ana Lucia Kassouf, "The Impact of the *Bolsa Escola/Família* Conditional Cash Transfer Program on Enrollment, Drop Out rates and Grade Promotion in Brazil", August 2010.

The matched database was created by researchers at the Brazilian Instituto de Pesquisa Econômica Aplicada (IPEA), while the *Educacenso* database is made available by the Brazilian Instituto Nacional de Estudos e Pesquisas Educacionais Anísio Teixeira (INEP). An in-depth description of the data and methodology used is offered in Chapter 4.

The study was founded on the hypothesis that schools with high numbers of attending students receiving *Bolsa Família* funds would show lower quantity and quality of key school inputs that previous studies have shown to contribute to learning, such as textbooks, educational facilities, or trained teachers. A secondary hypothesis was that schools would tend to have students from a similar socioeconomic class, meaning that most *Bolsa Família* recipient students will attend school with a high number of other recipient students.[17] The hypothesis for the secondary research question, concerning school inputs for the nation at large, was that the availability of inputs would differ based on the location or region of the school, with rural schools and schools in the poor Northeast having the least amount or lowest quality of materials available.

This study found that across Brazil, most schools possess the basic school inputs that have been shown to impact student performance, although there is a strong regional pattern to resource availability. Schools in the North and Northeast regions tend to lack many inputs, even some of the most basic ones, while schools in the Central-West region tend to consistently have the most and best school inputs. Students who receive *Bolsa Família* funds tend to be from the North and Northeast regions, so tend to lack the same

[17] Carnoy, *Cuba's Academic Advantage*, 41.

inputs. In general, however, the school inputs that are most commonly unavailable to *Bolsa Família* recipients are not those that have been shown in studies to have a high impact on student performance, and are also more dependent on regional patterns of availability than patterns of availability for welfare recipients.

Chapter 2: *Social Policy and* Bolsa Família

SOCIAL GUARANTEES TO THE BRAZILIAN PEOPLE

The approach to social policy that sparked the creation of wide-ranging programs like *Bolsa Família* stems from language in Brazil's 1988 Constitution. Title II, Chapter II of the constitution sets out social rights as "fundamental rights and guarantees" and explicitly lays out what these social rights include, beginning with "Education, health, work, leisure, security, social security, protection of motherhood and childhood, and assistance to the destitute".[18] The constitution also goes on to assign to the state, in addition to the family and society, the duty "to ensure children and adolescents … the right to life, health, nourishment, education, leisure, professional training, culture, dignity, respect, freedom and family and community life…".[19] Since this language is explicit within the constitution, should the state fail to uphold these duties, citizens can appeal to the courts, a privilege that has already been invoked as far as the state's duties in healthcare are concerned. Social programs and policies, then, are important investments for the state.

BOLSA FAMÍLIA'S DEVELOPMENT

The increasing popularity of this style of development makes it important to study Brazil's particular approach. The nation's relatively long history of cash transfer programs and experimentation with various models of implementation has resulted in a unique program, uniting 13 different ministries under one to unify various facets of the combat against poverty into one effort.

[18] Brazilian Constitution of 1988, title II, ch. II, art. 6.
[19] Brazilian Constitution of 1988, title VIII, ch. VII, art. 227.

Precursors to *Bolsa Família*

Starting in 1995, some municipalities in Brazil had implemented local cash-transfer programs, and all of them varied widely in their requirements and method. Cardoso swept some of these municipal experiments into a national program, called Bolsa Escola, providing cash transfers for eligible families fulfilling a school attendance requirement.[20] Other poverty alleviation programs started under Cardoso included Bolsa Alimentação, Cartão Alimentação, and Auxílio Gas, programs that only enjoyed limited success and did not have a great impact on poverty. All four targeted the same population, but were separately administered. Efficiency was severely limited by a lack of communication between the programs.[21]

***Bolsa Família* and the MDS**

Bolsa Família was announced in 2003, soon after Lula took office. Its objectives were "immediate poverty relief, … breaking the poverty cycle by way of conditionalities that reinforce social rights, … and the development of families".[22] Building off of earlier experience, Lula intended for *Bolsa Família* to sidestep some of the problems that had plagued the Cardoso-era programs. To that end, *Bolsa Família* is a nationally implemented program. Originally in Brazil, social programs were administered by the municipalities, to ensure that the government could be in direct contact with beneficiaries in the hopes that programs would reflect true need. By making the program a federally

[20] Tracy Beck Fenwick, "Avoiding Governors: The Success of *Bolsa Família*," *Latin American Research Review* 44.1 (2009): 109.
[21] Kathy Lindert et al., "The Nuts and Bolts of Brazil's *Bolsa Família* Program: Implementing Conditional Cash Transfer in a Decentralized Context" (Washington D.C.: World Bank Institute, June 2006), 67-68.
[22] Vera Lúcia Peixoto Santos Mendes et al., "Gestão dos Serviços Públicos e Participação Cidadã: Estudo com os Beneficiários do Programa *Bolsa Família*," *RAC Curitiba* 13 (2009): 110.

administrated one, there are fewer intermediaries, meaning less corruption and more funding for goals of the program.[23]

Bolsa Família also unites thirteen different government agencies in the fight against poverty. To head up the program, Lula created a new agency called Ministério do Desenvolvimento Social e Combate à Fome (Ministry of Social Development and the Fight against Hunger).[24] The other government agencies originally involved in social policies continue to be a part of *Bolsa Família*, but in a new format that partly allows, partly forces them to cooperate and share information. Although logistics and relationships between agencies within the program can become complicated, Lula's effort to centralize the fight and de-factionalize it has been hailed as brilliant. *Bolsa Família* has fewer gaps and redundancies because all the projects within the program use the same information database, the *Cadastro Único*, and same goals to determine eligibility and implementation methods.[25] There is also now one application and one card for government assistance, as opposed to the bureaucratic labyrinth of the previous system.

COMPONENTS OF *BOLSA FAMÍLIA*

Bolsa Família has a wide range of projects and programs to accomplish everything from cash transfers and building rain cisterns to eradicate thirst to vocational training of the poor and job creation. This constellation of projects allows the program to address the different needs of each of Brazil's many people groups: urban, rural, dwellers

[23] Fenwick, "Success of *Bolsa Família*," 115.
[24] Ministério do Desenvolvimento Social e Combate à Fome do Brasil, *Cidadania: O Principal Ingrediente do Fome Zero* (Brasilia, DF: MDS, 2005), 21.
[25] Fenwick, "Success of *Bolsa Família*," 115.

of the semi-arid region, quilombo members, the indigenous, and more.[26] There are far too many programs to enumerate each one, but Tables 1 and 2 list the major projects involved. Table 1 includes projects that target the immediate effects of poverty, while Table 2 lists projects that target long-term causes of poverty.

[26] FAO, "A Reference," 1.

Program category	Key components
Conditional cash transfers (immediate and long-term poverty)	• Eligible families receive a grant if they meet education, welfare, and health-related conditions. • Attempts to "break the intergenerational cycle of poverty" by ensuring health and education through a cash transfer incentive
Nutrition programs	• Meals at schools for children • Food for the indigenous • Vitamin distribution • Nutrition training and education
Food production and availability programs	• "People's restaurants" established to provide cheap and healthy meals for the urban poor • Food banks established, run by nonprofits from Brazilian civil society • Promotion of urban agriculture and community gardens to ensure stable source of food for poor • Food comes from local farms when possible, to ensure that government money spent on these projects works in tandem with money spent on bolstering agriculture
Tax incentives for workers	• Workers' Food Program to improve nutritional conditions • Attempts to improve quality of life, reduce accidents at work, and increase production through better nutrition and eradication of hunger
Tribute reduction	• Exemptions and decreases in duty on foods considered basic and indispensible to survival

Table 1: Projects targeting immediate effects of poverty[27]

[27] FAO, "A Reference," 18; MDS, *Cidadania*, 24-31.

Program category	Key components
Conditional cash transfers (immediate and long-term poverty)	• Eligible families receive a grant if they meet education, welfare, and health-related conditions. • Attempts to "break the intergenerational cycle of poverty" by ensuring health and education through a cash transfer incentive
Programs to bolster family agriculture	• Insurance for farms in agriculturally unstable areas to help a family survive during off-season • Insurance to cover loans for family farms • Program to purchase food from family farms for school meal program, hospitals, and other charities
Income generation programs	• Training and certification for workers, conditional on school attendance and entry to the job market • Organization of poor communities into projects that can be autonomously run and profitable • Integrating rubbish pickers into the recycling program on government pay • Microcredit
Civil society mobilization	• Social centers in vulnerable communities to provide direct assistance and social protection • Government partnership with private sector and NGOs in all *Bolsa Família* projects • Encouragement of volunteer work • Avenue for donations to support *Bolsa Família* programs

Table 2: Projects targeting long-term causes of poverty[28]

***Bolsa Família*'s conditional cash transfers**

Conditional cash transfers are the "crown jewel," so to speak, of *Bolsa Família*, and their success in Brazil and in other countries has generated a lot of interest in using those strategies in other countries. The program is meant to provide money for basic needs to the poor but also to encourage poor families to invest more in health and

[28] FAO, "A Reference," 18; MDS, *Cidadania*, 24-31.

education to "break the inter-generational transmission of poverty".[29] *Bolsa Família*'s conditional cash transfer program provides money on an electronic card to the mother of families in extreme poverty as well as those who are impoverished by national poverty line standards, all with an income of less than R120 a month.[30] Extremely poor households receive a minimum of R58 and a maximum of R112 a month, while poor households can receive a maximum of R54. About 11 million families receive transfers, making this one of the largest cash transfer programs worldwide.[31]

The Ministry of Social Development and the Fight Against Hunger (MDS) leads the program, while municipal governments continue to be responsible for registration and monitoring on the ground in smaller regions, as was the case with previous cash transfer programs. While registration has its own set of difficulties related to properly targeting the program, the use of a central federal database of information has streamlined the process and helped *Bolsa Família* reach about a quarter of Brazil's population. Monitoring, a little more complicated, involves ensuring that recipients of cash transfers follow the conditions necessary to receive them.[32]

Education and health priorities shape the conditions that must be met to receive cash transfers. Children between age 6 and 15 in families receiving the benefits must attend school at least 85% of the time. For children six and younger, as well as pregnant

[29] Lindert et al., "Nuts and Bolts," 15.
[30] Cecelia Rocha,"Developments in National Policies for Food and Nutrition Security in Brazil," *Development Policy Review* 27.1 (2009), 55.
[31] Fábio Veras Soares, et al., "Evaluating the Impact of Brazil's *Bolsa Família*: Cash Transfer Programmes in Comparative Perspective," *IPC Evaluation Note* 1 (2007), 1.
[32] Rocha, "Developments in National Policies," 55.

and nursing women, there must be a record of health clinic visits and vaccinations.[33] These requirements were developed in part by adjusting the conditions from previous cash transfer programs, changing them to focus on the family rather than the individual and to achieve better results.[34]

SUCCESSES AND FAILURES

General success

Bolsa Família has been effective in keeping costs down, reaching its target population, and in reaching many of its goals. Despite the fact that *Bolsa Família*'s conditional cash transfer program is the largest in the world and reaches 11.1 million families, it only costs around 0.5% to 0.8% of Brazil's GDP.[35] Given that much of Brazil's poverty occurs in urban conglomerations of more than 50,000 people, many of the programs reinforce one another. *Bolsa Família* demonstrates a formidable multiplier effect, which helps to produce impressive results with less spending.[36] Food security programs like school meals, food banks, and community kitchens rely in part on civil society support and donations from private actors, rather than exclusively using government funds.[37] Consolidation of social policy into the federal sphere with *Bolsa*

[33] Rocha, "Developments in National Policies," 55.
[34] Lindert et al., "Nuts and Bolts," 17.
[35] Rocha, "Developments in National Policies," 61.
[36] José Graziano da Silva, "Segurança alimentar: uma construção comunitária," *Fome Zero: Textos Fundamentais* (Rio de Janeiro: Garamond Ltda., 2004), 16.
[37] FAO, "A Reference," 14.

Família also cuts out intermediaries as well as redundant programs, reducing administrative costs and killing overlapping government spending.[38]

Targeting for *Bolsa Família* is relatively accurate, and any problems it suffers are understandable given the size of the program. *Bolsa Família* reaches about 41% of the poor. Compared to similar programs in Mexico, Brazil's program reaches more of the poor, although it also has higher rates of non-poor beneficiaries, or leakage, than the other program. *Bolsa Família* funding also greatly impacts not only the extremely poor, but also other income percentiles within the poor population. In essence, *Bolsa Família* funding is extremely progressive for all of the underprivileged in the country, rather than just the bottom 10% or 20%.[39]

The program has already made an observable impact on income distribution and poverty, education, and health and nutrition among the poor in Brazil. By 2007, Brazil had already met the Millennium Development Goal to halve extreme poverty.[40] By 2009, the number of Brazilians living under the poverty line had dropped by 19.31%, a decrease attributed to the impact of *Bolsa Família*.[41] Another study states that *Bolsa Família* caused a 12% decrease in the poverty gap and a 19% decrease in poverty severity. While consumption has not increased among poor households, *Bolsa Família* has changed what people spend their money on, increasing income shares spent on food, education, and clothing for children.[42] Interestingly, *Bolsa Família*'s real worth became obvious in its

[38] Fenwick, "Success of *Bolsa Família*," 114-115.
[39] Soares et al., "Evaluating the Impact," 3-4.
[40] FAO, "A Reference," 7.
[41] Fenwick, "Success of *Bolsa Família*," 126.
[42] Soares et al., "Evaluating the Impact," 4-6.

role during the 2008-2009 financial crisis. Brazilians were somewhat protected from the effects on their income, and *Bolsa Família*'s focus on local markets and consumption "helped to compensate the external demand contraction." Brazil was not as negatively impacted by the crisis as other countries were, and was able to rebound faster as well, all thanks to *Bolsa Família*'s role as a safety net.[43]

Inequality has also decreased since *Bolsa Família*'s establishment – the Gini index decreased by 4.7%, and it is estimated that 21% of the decrease is directly a result of *Bolsa Família* programs. Labor participation among beneficiaries is also higher by 2.6% than that among those not receiving funds. Interestingly, women have especially seen an increase in labor participation – participation among female beneficiaries is 4.3% higher.[44]

Health and nutrition indicators also demonstrate *Bolsa Família*'s positive effects. Infant mortality has decreased by 47% between 1990 and 2006, while the number of children under two years old who are underweight decreased in 72.4% between 2000 and 2006.[45] Infant malnutrition fell from 4.6% in 2002 to 1.7% in 2006. Hospitalizations due to malnutrition for all ages decreased from 1.02% to 0.53% between 2002 to 2008.[46]

General problems

Bolsa Família's success in targeting and improving health and education has been tempered. Many of these problems are supply-side failures, and indicate that the

[43] FAO, "A Reference," 7-8.
[44] Soares et al., "Evaluating the Impact," 4-6.
[45] Rocha, "Developments in National Policies," 62.
[46] FAO, "A Reference," 7.

government needs to invest money in building up infrastructure and providing health and education services. As one Brazilian author warned, without these investments, any increase in *Bolsa Família* funding will only produce limited results.

Bolsa Família is currently only reaching 41% of the poor in Brazil. To reach more will require not only more funding but better planning. Increasing beneficiaries will create bureaucratic problems and increase the likelihood of funds reaching those who should not be eligible or are not poor. This is a problem given that leakage has already reached a high level – 49% of all beneficiaries are not poor. While *Bolsa Família* is still regarded as a well targeted program, attempting to increase coverage will create even more problems.[47]

Despite the fact that cash transfers are linked to conditionalities requiring children to be immunized and to be brought to clinics, *Bolsa Família* has been largely ineffective in increasing immunization and clinic visits. There has been no increase in child vaccination. There has also been no decrease in malnutrition for children between 12 and 36 months old. Studies indicate that this failure to improve health is most likely the result of a lack of supply, either in availability of vaccinations or in number of clinics or staff at clinics. If health conditionalities are placed on cash transfers, special care should be taken to ensure that those conditionalities can be fulfilled.[48]

[47] Soares et al., "Evaluating the Impact," 3.
[48] Soares et al., "Evaluating the Impact," 5-6.

Successful impact in education

Bolsa Família has had a positive impact on education. School enrollment increased incrementally for grades 1 through 8 the longer the program was in place, beginning with a 2.8% increase after one year of implementation and rising to a 5.5% increase after three years of implementation for an average total of 17% increase in enrollment attributable to *Bolsa Família*. *Bolsa Família* is also statistically linked to a decrease in dropout rates of an average 1.6 percentage points, and an increase in grade promotion by an average 3 percentage points.[49] These results are encouraging, as the Brazilian government feels that supporting poor students' attendance rather than just requiring enrollment will break "the inter-generational cycle of poverty".[50]

Problems in impacting education

The assumption that education will improve employment opportunities and help break the poverty cycle must be called into question. The difference in average wages between someone who has only completed primary school and someone who has completed through secondary school is small and fluctuates greatly. In the late 1990s and early 2000s, the difference began to drop rather consistently. The shrinking difference is especially striking for women. While there is a clear difference in wages for those who complete high school and college, completing the compulsory years of education does not appear to greatly affect wages.[51] It will be hard to convince the poor that their child

[49] Glewwe and Kassouf, "Impact on Enrollment," 24-33.
[50] Lindert et al., "Nuts and Bolts," 10.
[51] Chiara Binelli, Costas Meghir, and Naercio Menezes-Filho, "Education and Wages in Brazil" (The Institute for Fiscal Studies, 2008), 12.

should spend eight years in primary and secondary education when there is no guaranteed return on those lost years of work.

More interestingly for the purposes of this research, increased enrollment does not necessarily equate with increased learning. Although attendance has been improved for poor children through the influence of the conditional cash transfers, these children are less likely to perform well and more likely to fail to advance than children not receiving *Bolsa Família* benefits. This is most likely because children who are now attending school due to *Bolsa Família* requirements have been out of school for some time or may never have attended before.[52] This paper intends to discover if it may also be in part because *Bolsa Família* recipients attend disadvantaged schools.

[52] Soares et al., "Evaluating the Impact," 5.

Chapter 3: *School Inputs and Learning*

A debate about the importance of school inputs for student achievement has gone on since the publication of the Coleman Report in 1966, which found that resource differences at schools in the United States had an insignificant affect on student achievement in comparison to a student's family characteristics and social circumstances – the "Coleman effect". The validity of this report's finding, at least for developing nations, was called into question by a second well-known study conducted in the 1980s, concluding that school quality was more influential than family or social effects for less economically developed nations. Subsequent studies have found that specific school inputs can influence achievement, especially in developing countries like Brazil, and others can influence teacher effectiveness, which is generally regarded as important for learning. More recent studies find that the Coleman effect is becoming increasingly stronger in developing nations like Brazil, with rising economic development and higher school quality across the nation.[53] Even with this change, the existence of major shortages of school inputs *is* important for student success, especially for basic inputs.

EQUITY IN SCHOOL FINANCE

School finance equity plays an important role in student achievement and performance. Allocating resources appropriately can contribute to an educational system in which more students can compete both academically during their school career and beyond, once they have entered the labor market as adults. This is especially true given

[53] David Baker and Gerald K. LeTendre, *National Differences, Global Similarities: World Culture and the Future of Schooling* (Palo Alto, CA: Stanford University Press, 2005), 35-41.

that adult incomes are established in large part based on a student's education and performance.[54]

There are many different ways to conceptualize school finance, all of which aim to achieve a different type of equity of resources for students and schools. Horizontal equity assesses whether all students or all schools have the same financing and resources available to them. This conceptualization disregards any differences between various groups of students or schools, whether based on class, race, need, or any other factor that may influence educational profile or resource need. Vertical equity, on the other hand, emphasizes these differences, and aims to create a system in which financing is tailored to the individual needs or expenses of these different groups.[55]

A third type of equity is based on fiscal neutrality. This principle concentrates on the need to provide financing that is independent of local fiscal capacity. This means that schools or children located in areas with lower wealth or lower household incomes should still have adequate and equal funding with comparison to other areas without these issues. Finally, the fourth facet of school finance equity focuses on effectiveness, with an eye to allocate funding in a way that accomplishes educational goals and increases school quality. This is difficult to assess and to implement into funding decisions.[56]

Measuring any one of these definitions of school finance equity can be based on a variety of variables, depending on which resource an educational system is attempting to

[54] Allan R. Odden and Lawrence O. Picus, *School Finance: A Policy Perspective* (New York: McGraw-Hill, Inc., 1992), 53.
[55] Odden and Picus, *School Finance*, 60-63.
[56] Odden and Picus, *School Finance*, 63-64.

equalize or emphasize in its approach to improving student performance. Fiscal and physical inputs are the most commonly used targets in school finance equity, as they are the easiest to measure. Educational process variables, which include specifics on instruction, time spent in classroom, and administrative policies, are another grouping that can be targeted. Finally, many modern studies focus on outcomes or achievement variables, like graduation, test scores, or postsecondary attendance.[57]

This study's focus on school inputs, then, may be able to construct a general idea of school finance equity in Brazil. Although school input variables do not present the full picture of educational quality in relation to funding, they are important indicators of how well a school is financed. Patterns that emerge nationally for all students and for *Bolsa Família* recipient students specifically can indicate whether there are regions or student subgroups that are not being adequately reached. These patterns can inform future studies on school finance reform in Brazil.

IMPORTANCE AND IMPACT OF SCHOOL INPUTS

While many scholars assert that school inputs explain very little about student achievement in developed countries, they can have a significant impact on achievement in the developing world. This effect is independent of the influence of socioeconomic class or family characteristics. For the most part, influential school inputs tend to be basic

[57] Odden and Picus, *School Finance*, 54-60.

ones. More expensive inputs may not actually have all that significant of an impact, making them less important for countries with limited budgets.[58]

Basic school impacts, as stated before, tend to be more influential in developing countries. Building school facilities in locations where basic infrastructure is lacking increases educational attainment, while expansion of infrastructure beyond the basic is only weakly linked to performance.[59] Related to the concept of facilities and infrastructure, studies have found mixed results on whether multigrade and multi-age classrooms are beneficial, neutral, or negative for student performance. While there is the possibility of increased peer effects and teaching among students by peers through the combination of multiple grades in one room, leading to better performance, most teachers do not encourage that behavior. In general, multigrade classrooms appear to either have no effect on student performance, or a slightly negative effect.[60]

In multiple studies, the availability of textbooks in the classroom has shown a consistent positive effect on student achievement.[61] This is especially true in Latin American countries, in rural schools, and for students from low-income families. Desks in classrooms have also consistently demonstrated significant positive statistical impact

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[58] Bruce Fuller, "What School Factors Raise Achievement in the Third World?," *Review of Educational Research* (57.3, 1987) , 257, 276-279.
[59] Ibid, 119.
[60] John A. C. Hattie, "Clasroom composition and peer effects," *International Journal of Educational Research* (37.5, 2002).
[61] Emiliana Vegas and Jenny Petrow, *Raising Student Learning in Latin America: The Challenge for the 21st Century* (Washington, D.C.: World Bank, 2008), 119.

on student achievement, although one scholar points out that the desk may be a symbol or proxy for a "modern school" rather than an important input on its own.[62]

More complex inputs are rarer in developing countries. Some, like school libraries, are influential – in Latin America, studies using school library data showed that libraries and library usage is correlated with higher student performance. Other inputs, like science laboratories, are very expensive and do not have consistent or clear relationships with student achievement.[63]

In general, the relationship between quantity of inputs and student achievement may be relatively weak for many inputs. More important to consider is resource allocation in accordance with educational context and need, especially important in a country with problems of severe inequality.[64]

Technology and Conmmunication Inputs

Information and communication technologies (ICT) are increasingly trendy in education, especially educational projects underwritten by international aid organizations. Many developing countries are being pushed to incorporate computers and the Internet into their instruction. In Brazil, ICT usage is expanding rapidly through a variety of government programs. The National Program for IT Integration in Education, started in 1997, seeks to place computers and computer labs in schools, and has done so in at least 64,600 schools. The Broadband in School Program, which began in April 2008, seeks to connect all urban public schools to the Internet. The One Computer per Student program,

[62] Fuller. "School Factors.".
[63] Vegas and Petrow, *Raising Student Learning*, 119.
[64] Vegas and Petrow, *Raising Student Learning*, 118.

piloted in 2007 in five cities, gave computers to all students and faculty in a school, as well as training on how to use them and educate others.[65]

Whether ICTs actually have a significant impact on student performance, or an impact at all, is unclear, despite the enthusiasm. In some contexts, where teachers are poorly trained or where countries have few resources, using computers in the classroom as a part of instruction can increase student performance. In other contexts, computer-assisted learning either produced no results, or may even decrease student performance. One study of PISA 2000 data, which included Brazilian data, found that computers in schools did not affect student performance, while computers at home tended to increase test performance. ICTs' mixed performances may be due to a variety of things. Teachers may be poorly trained to work with computers or ICTs may not be properly integrated into curriculum and instruction. Studies may also have been conducted too soon – using ICTs in education require training and experience, both of which take time. [66]

SCHOOL INPUTS IN BRAZIL

Based on the literature reviewed in this chapter, the most important school inputs for Brazil are the basic ones that allow a school to function at all, like basic infrastructure, textbooks, or a school building. Other more complex inputs, like the presence of a library or a science lab on campus, do not have significant impact on achievement, although it may be interesting to note the distribution of these more expensive inputs based on what it may indicate about finance equity. The presence of ICT inputs, like computers or

[65] Brazilian Internet Steering Committee, *TIC Educação 2010* (2010), accessed June 2011, http://www.cetic.br/tic/educacao/2010/index.htm, 221-222.
[66] Vegas and Petrow, *Raising Student Learning*, 120-121.

Internet connections, is encouraging but not necessarily indicative of a higher quality school, based on the mixed results of studies on these inputs' impact on student achievement.

Chapter 4: *Patterns of School Inputs across Brazil*

Before considering the patterns of school inputs for students receiving *Bolsa Famílía*, a base map of school input patterns should be established. This base map will help to free the welfare-specific analysis from being skewed by pre-existing shortages or biases in facility and material availability that are independent of a student's welfare status or a school's percentage of welfare recipient students.

DESCRIPTION OF DATA

Information on schools was drawn from the 2008 *Educacenso*. The *Educacenso* is an annual census carried out by INEP, in conjunction with several other government agencies of statistics or education, to study the basic educational system and ensure transparency. The resulting databases include extensive information on the four groups targeted: 129 variables for schools, 58 for classes, 56 for students, and 94 for teachers. This study focuses solely on the database available on schools, which includes a spectrum of characteristics and inputs. Below, Table 3 lists the number of variables in each major grouping of variable types.

Variable grouping	Number of variables
Identifying variables	4
School location	5
School type and funding	6
Basic functions and regulation	5
Facility type	9
Public servicing	19
Administrative capacity	5
Teaching capacity	19
Non-educative resources	6
Technological resources	12
Resources for special populations	15
Instruction offered	24

Table 3: Variable groupings for 2008 *Educacenso* schools dataset

For most variables, there are no missing values. Those variables with missing values had a consistent 19.8% missing, and mapping revealed that these were in São Paulo state. As such, many municipalities in São Paulo state cannot be mapped, and are left blank.

METHODOLOGY

The 2008 *Educacenso* includes data for 250,376 schools across Brazil. With this quantity of data covering a large area, mapping variables with GIS offers the best way to see regional patterns and correlations between school variables or with variables of poverty. In order to prepare the data for mapping, data was aggregated by municipality code, resulting in percentages by municipality for binary variables and averages by municipality for numeric variables. A total of six identifying and location variables, such as census year or school code, and seven non-binary, non-numeric variables, such as indigenous language spoken in school, were dropped.

Twenty other variables were dropped, based on the inability to properly map them. These variables were numeric, and could not be compared across municipalities or states without including more information about the number of staff and teachers employed at each school, and the number of students enrolled. Using these variables would also require a research-based hypothesis on the impact of each variable and what the ratio between a variable and students or staff should be. These variables included things like number of books reused per year or number of administrative staff members. Where possible, several of these variables were transformed into binary variables in an effort to create a variable that would indicate the basic presence of an input, like computers for students. Maps of these variables may not be truly indicative of the privilege or disadvantage for some schools, but will at least give a general idea of where there is a *complete* lack of that input.

The resulting dataset was linked to geo-information using shapefiles available through Brazil's Instituto Brasileiro de Geografia e Estatística (IBGE). IBGE's most recent shapefiles are based on the 2007 South American Datum mapping data, and use the same municipality codes included in *Educacenso*.

Brazil is broken down in 27 federative units, the country's first administrative division. Within those units, there are 5,564 municipalities, Brazil's second administrative division. The maps shown in this chapter show each municipality outlined in grey, and information on school inputs averaged for each municipality and assigned a color corresponding to that value range.

PATTERNS OF SCHOOL INPUTS AND CHARACTERISTICS

School location and facility type

Across Brazil, 52.53% of all schools are in urban areas and 47.47% in rural areas. More interestingly, 20.74% of schools only use one room, indicating that they are multigrade classrooms. While the literature is split on whether this has a neutral or negative impact on student achievement as discussed in Chapter 3, it does demonstrate an interesting lack of infrastructure for Brazilian schools.

Public servicing and utilities

The availability of utilities at a school is one of the most basic inputs – does a school have water? Power? Sewage capacity? For these variables, 19.8% of schools lacked data. After mapping, it appears all of these schools were in São Paulo state, where there are several blank spaces in the map.

Overall, very similar patterns emerged for water, power, and sewage. Schools in the North and Northeast regions tend to be separate from public networks of utilities. These regions also tend to be where schools with no utilities are located. Conversely, the South and Southeast regions tend to have access to utilities, especially as parts of the public networks. Other regions did not demonstrate consistent patterns

Very few schools lack access to water: only 0.38% have no access to water, and the majority of these schools are in the North and Northeast regions, in Pará and Maranhão, with one outlier in Bahia possibly due to an error in the data. However, Figure 1 shows that only 50.24% of schools are receiving water from the public network. Schools in the North region are almost uniformly *not* connected to the public water

network, while the South and Southeastern regions tend to have more schools on public water. Mato Grosso do Sul and São Paulo state have the highest rate of schools hooked up to the public network. In general, however, there is little consistency about where schools are likely to be hooked up to public water – municipalities with 75% of schools or more connected are located right next to a municipality with 25% of schools or fewer connected, and so on.

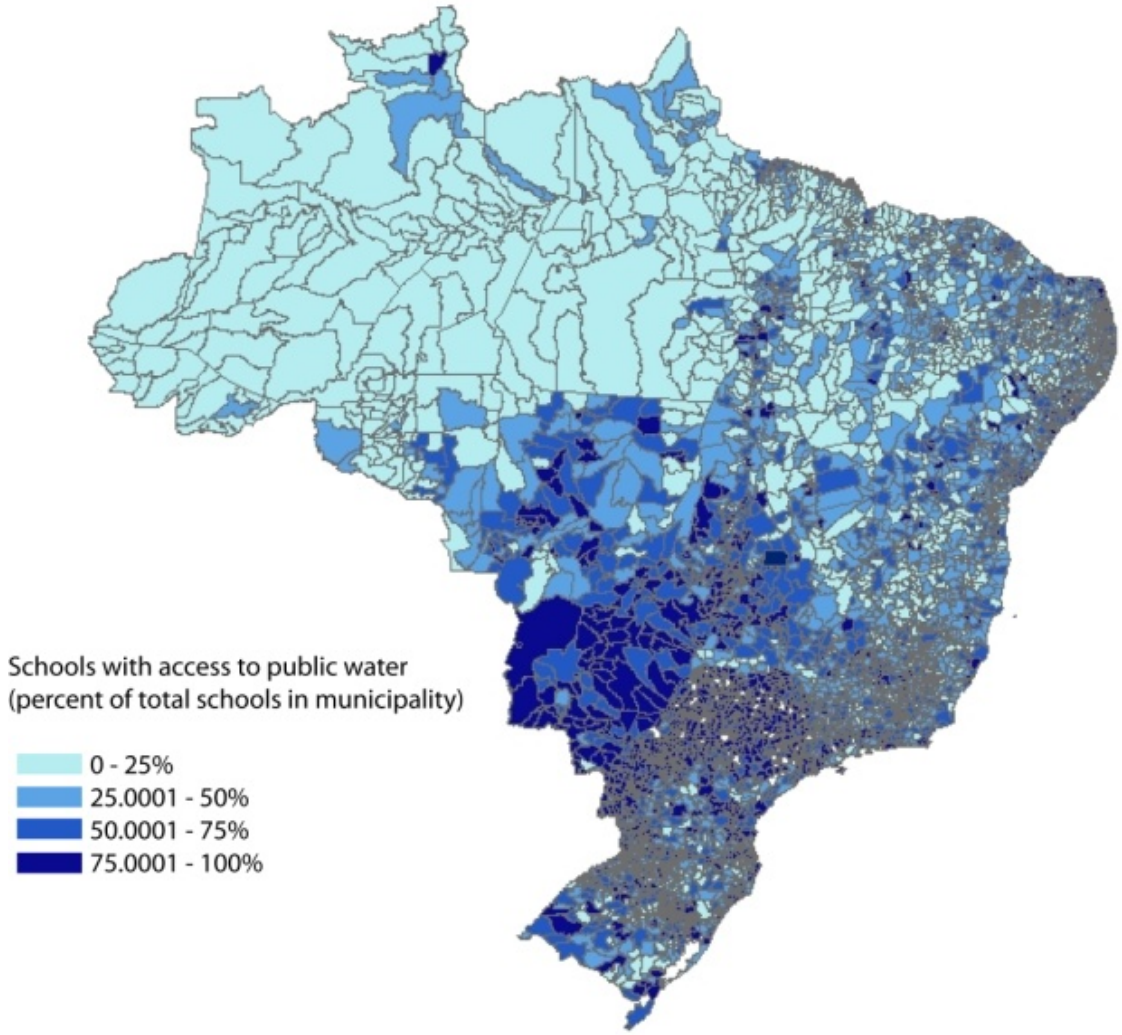

Figure 1: Schools with access to public water

Likewise, very few schools lack sewage capacity: 5.36% of schools have no infrastructure to handle sewage. Just as with access to water, almost all of the schools lacking access to sewage capacity are in the North and Northeast, spread across states

from Acre to Piauí. 31.74% of schools are connected to public sewage networks and another 44.05% use septic tanks.

The North and Northeast are at a disadvantage again in energy, seen below in Figure 2. 7.11% of schools lack access to electricity, and a majority of those schools are in the North and Northeast, along with a few locations in Mato Grosso. Interestingly, however, Figure 3 shows that the public network for electricity appears to be less limited than that of water or sewage. While the North region and Mato Grosso state are disadvantaged in access to the public network, those regions still have a high number of municipalities with moderate access to electricity.

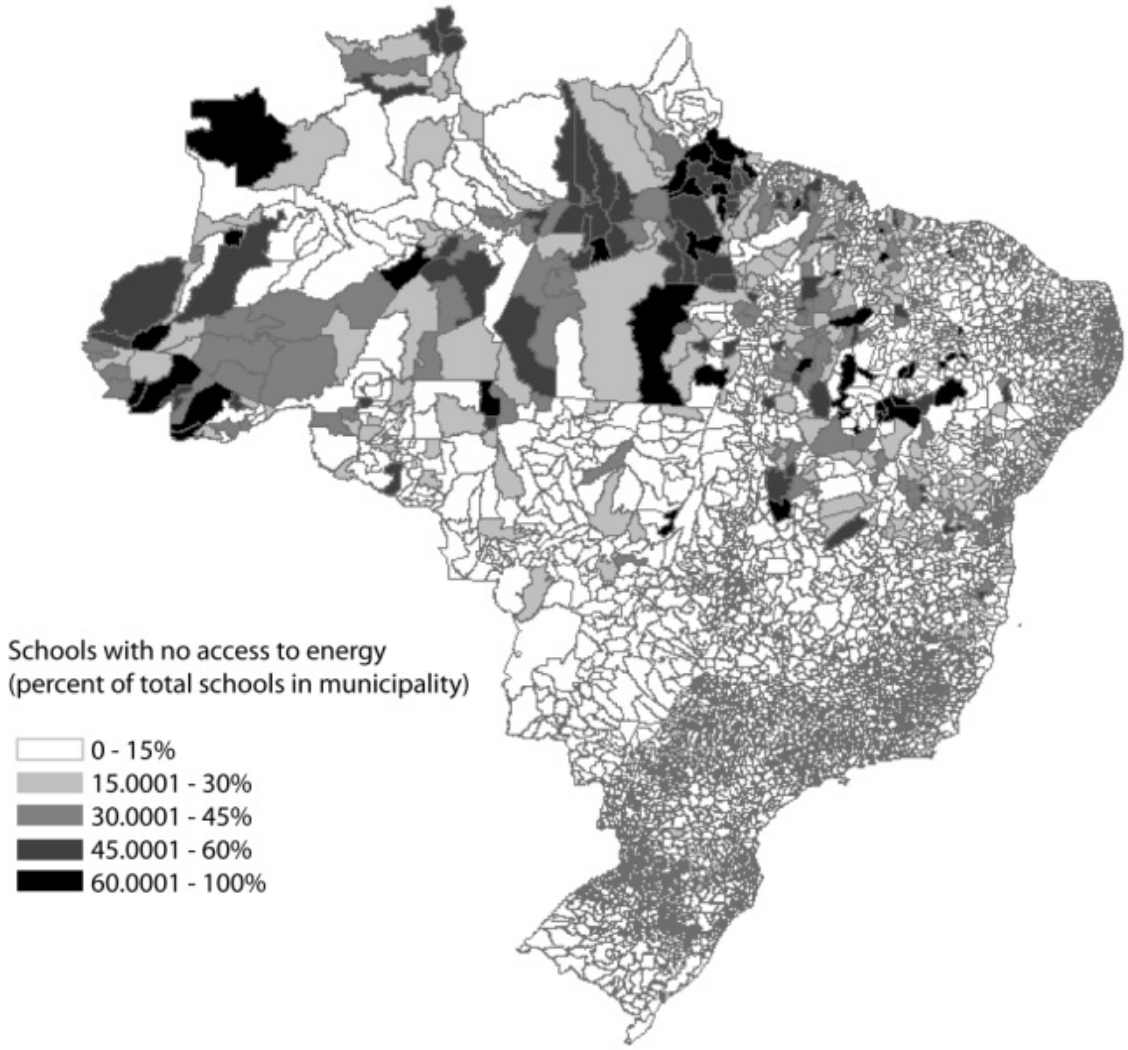

Figure 2:Schools with no energy access

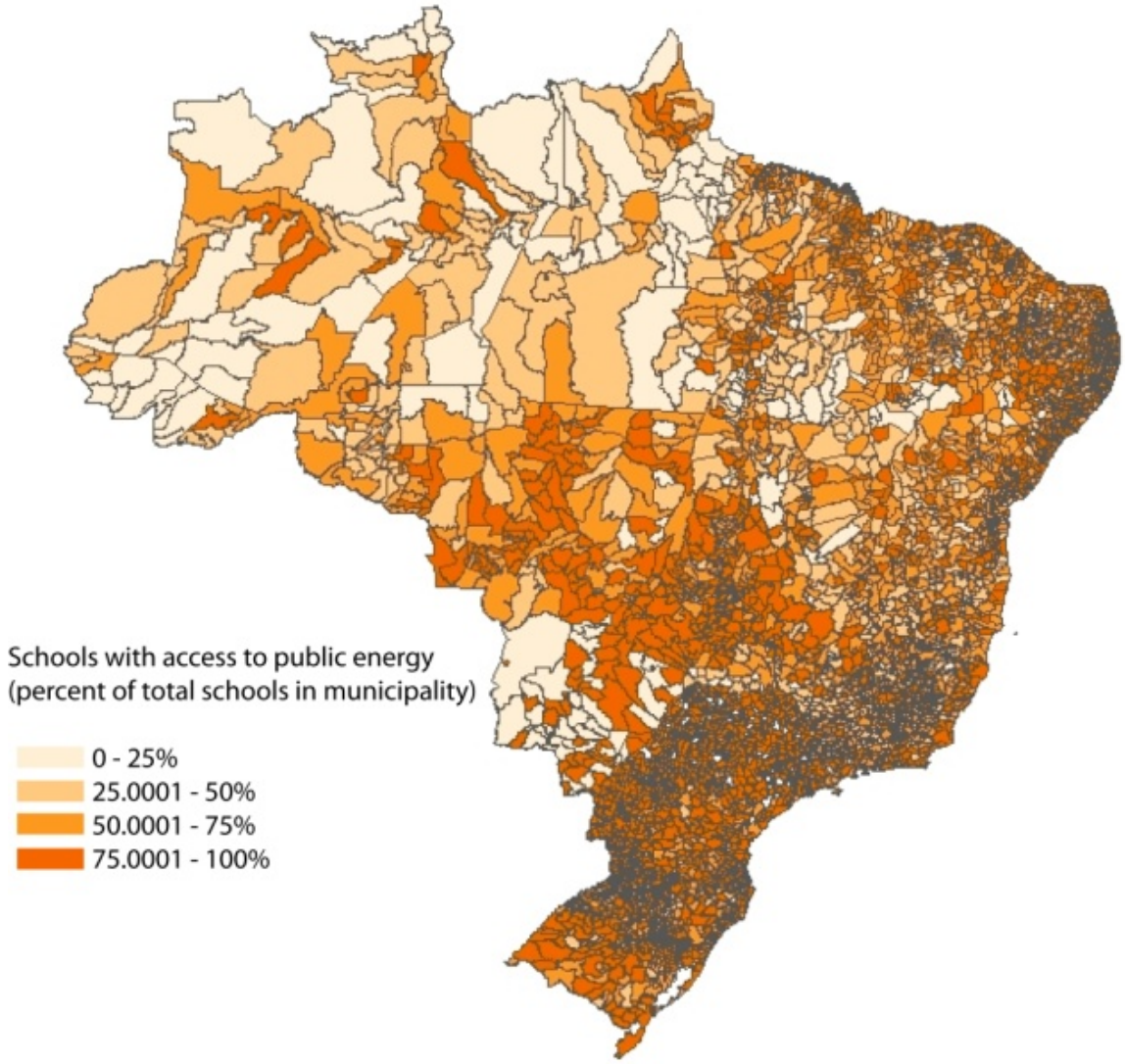

Figure 3: Schools with access to public energy networks

Administrative capacity

The existence of facilities and computers for administrators, as well as teachers' offices or lounges, can indicate whether administrative capacity is being bolstered by investment in school inputs or not. Teachers' offices or lounges are here considered part

of administrative capacity because they are a feature that contributes to working conditions, not actual teaching or educational work.

Since the data on computers for administrators is in a raw numeric form as opposed to a percentage, it is not generally useful for comparison among municipalities or states. A municipality with small schools may have an average of 3 computers per school for administrators, which may be no worse than an average of 14 computers for a municipality with large schools. In order to solve this problem of comparison, the map in Figure 4 shows whether a municipality has an average of 0.5 computers or fewer versus an average of more than 0.5 computers. This is solely meant to give an indication whether computers are available for administrators at all, without dealing with the question of ratios of people to computers and so on.

As seen in Figure 4, the availability of computers for administrative use has a strong regional pattern. The map below aggregates the number of computers for all schools in a municipality, then divides by the number of schools. Most municipalities in the North and Northeast regions do not have even an average of 0.5 administrative-use computers, while in the Central-West, Southeast, and South regions most municipalities *do.*

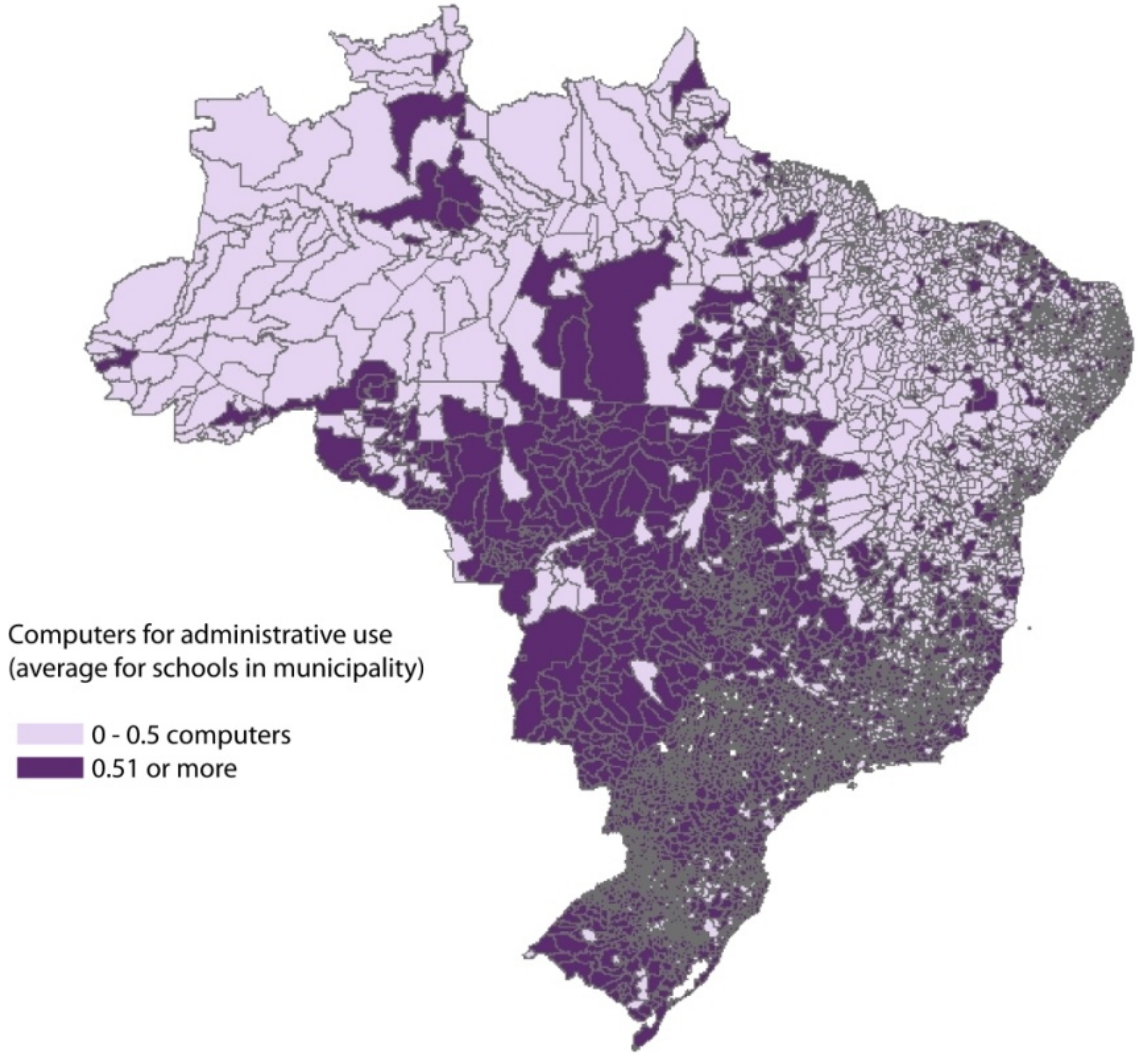

Figure 4: Administrative-use computers

To double check whether the frequency of administrative computers demonstrated by the map is correct, the range for all schools nationally can be checked. For administrative computers, there is a range between 0 and 1370, with 64.25% of schools

having 1 or 2 computers. This seems to indicate that the above map is a plausible representation of administrative computer availability in Brazil.

Interestingly, administrative offices, which 48.6% of all schools have, do not follow as strongly the North vs South pattern that has emerged with other inputs, as illustrated in Figure 5. While the South region still shows a higher prevalence of administrative offices, in general the entire country barring Mato Grosso do Sul shows little consistency. Even in the South region of the country, there are a great number of municipalities with low averages of schools with administrative offices. Approximately half of the municipalities in Mato Grosso do Sul, however, have 75% or more of schools with administrative offices, and the remaining municipalities have averages between 50% and 75%. In general, it seems that administrative offices may be only moderately prevalent in Brazil as a nation. Teachers' offices or lounges display very similar characteristics to administrative offices, with a weak presence nationally, a strong presence in Mato Grosso do Sul, and a slightly higher prevalence in the South versus the North.

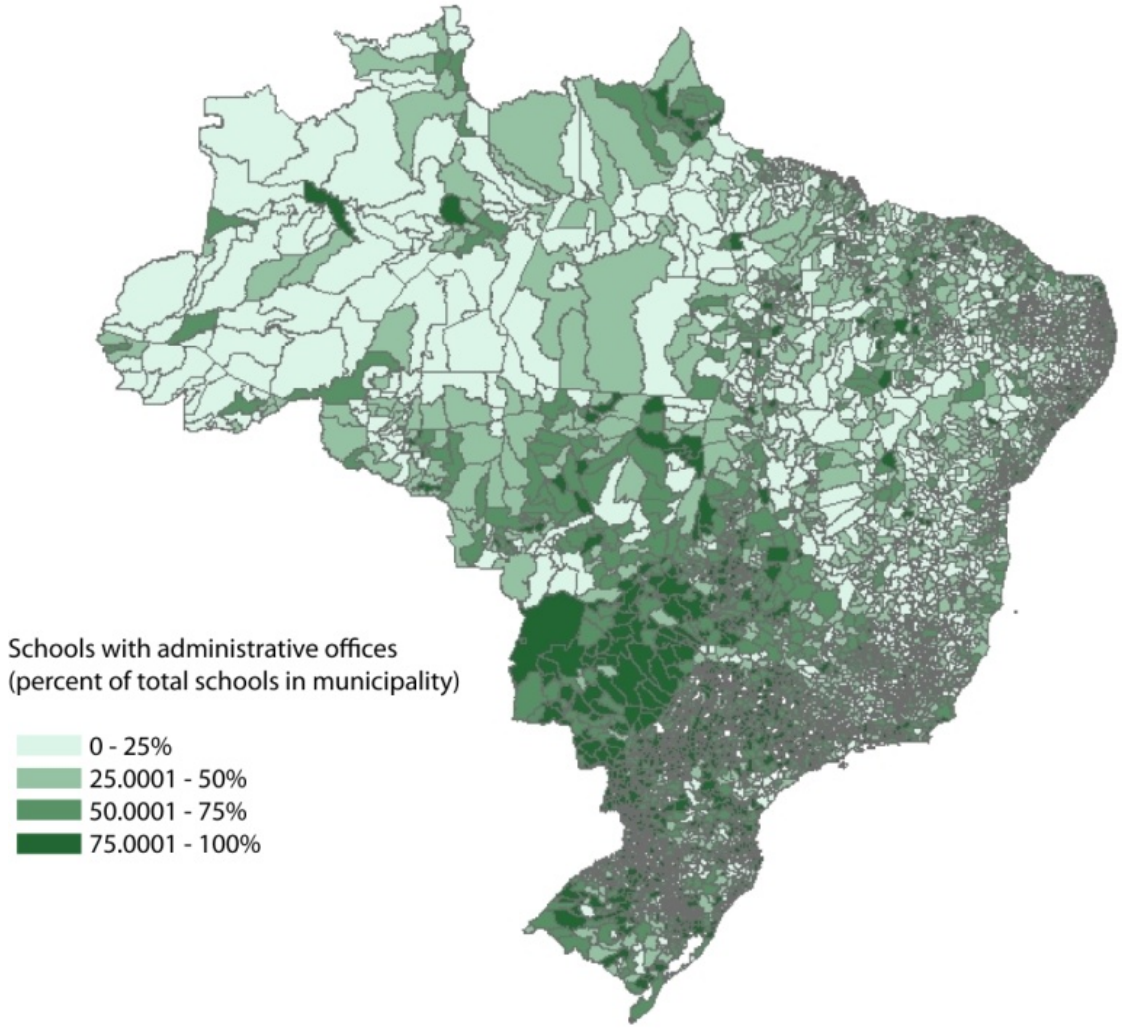

Figure 5: Administrative offices

Teaching capacity

Inputs considered in this section facilitate different types of learning. While variables existed in this dataset to consider inputs that contributed to overall learning, like number of classrooms or textbooks available, these variables were raw numeric sums that cannot be easily compared across municipalities or states without including information

about the size of schools and number of students enrolled in each grade. Enrollment per grade information is not available in this dataset.

Surprisingly few of Brazil's schools have libraries – only 29.98% of schools nationally. Very few municipalities had libraries in 80% or more of their schools. While there was evidence that there are slightly more libraries in the South and Southeast regions, in general there were not many schools with libraries. This can be seen in Figure 6.

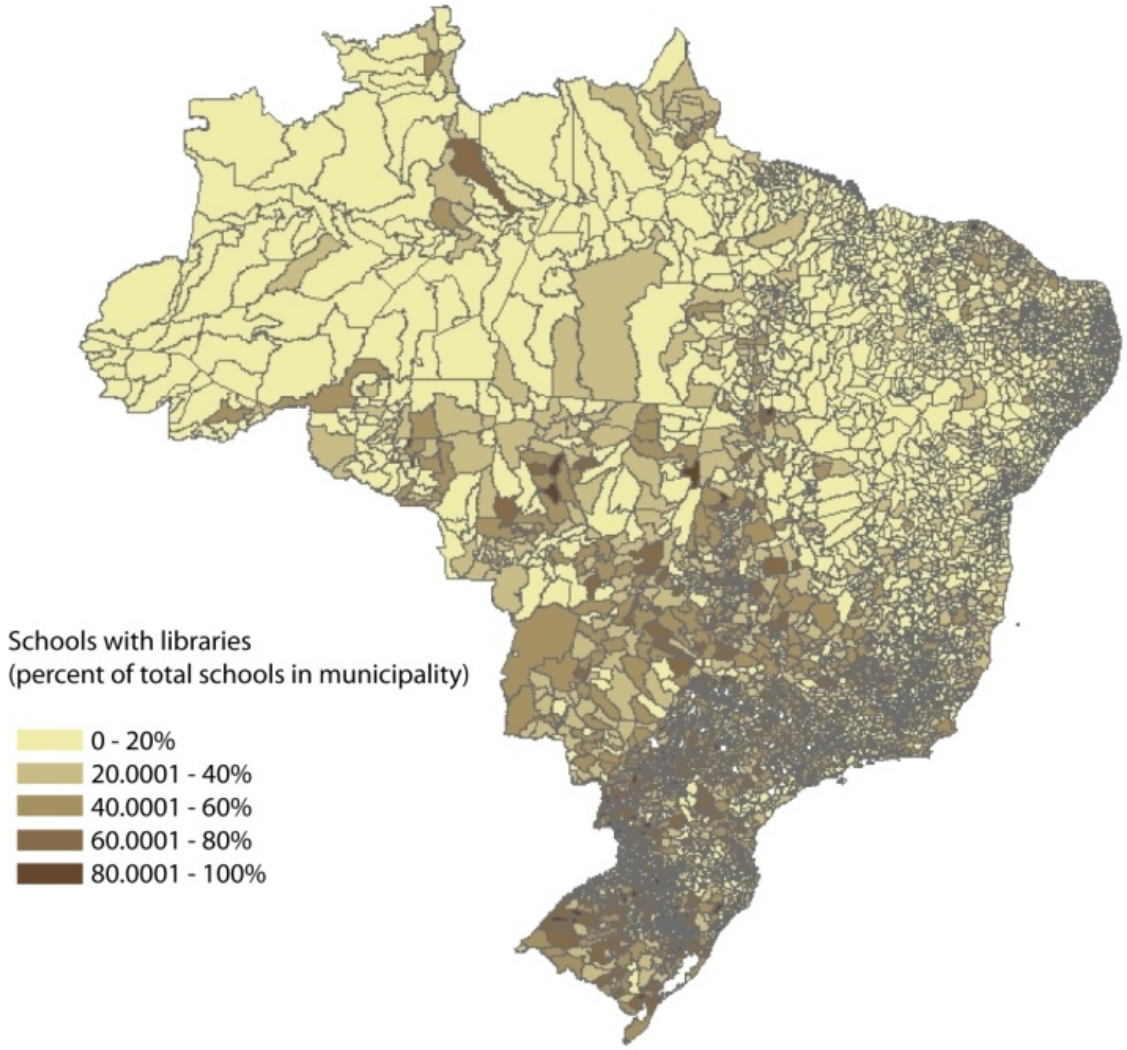

Figure 6: Schools with libraries

Only 7.19% of all Brazilian schools have science labs. There are also few computer laboratories – only 21.01% of schools nationally have one. Figure 7 below shows this low prevalence of computer labs – many municipalities have the lowest percent average of schools with computer labs possible, even in the South and Southeast

regions. However, the same pattern emerges – most labs are in the South and Southeast, and Mato Grosso do Sul has the most consistent levels of schools with labs.

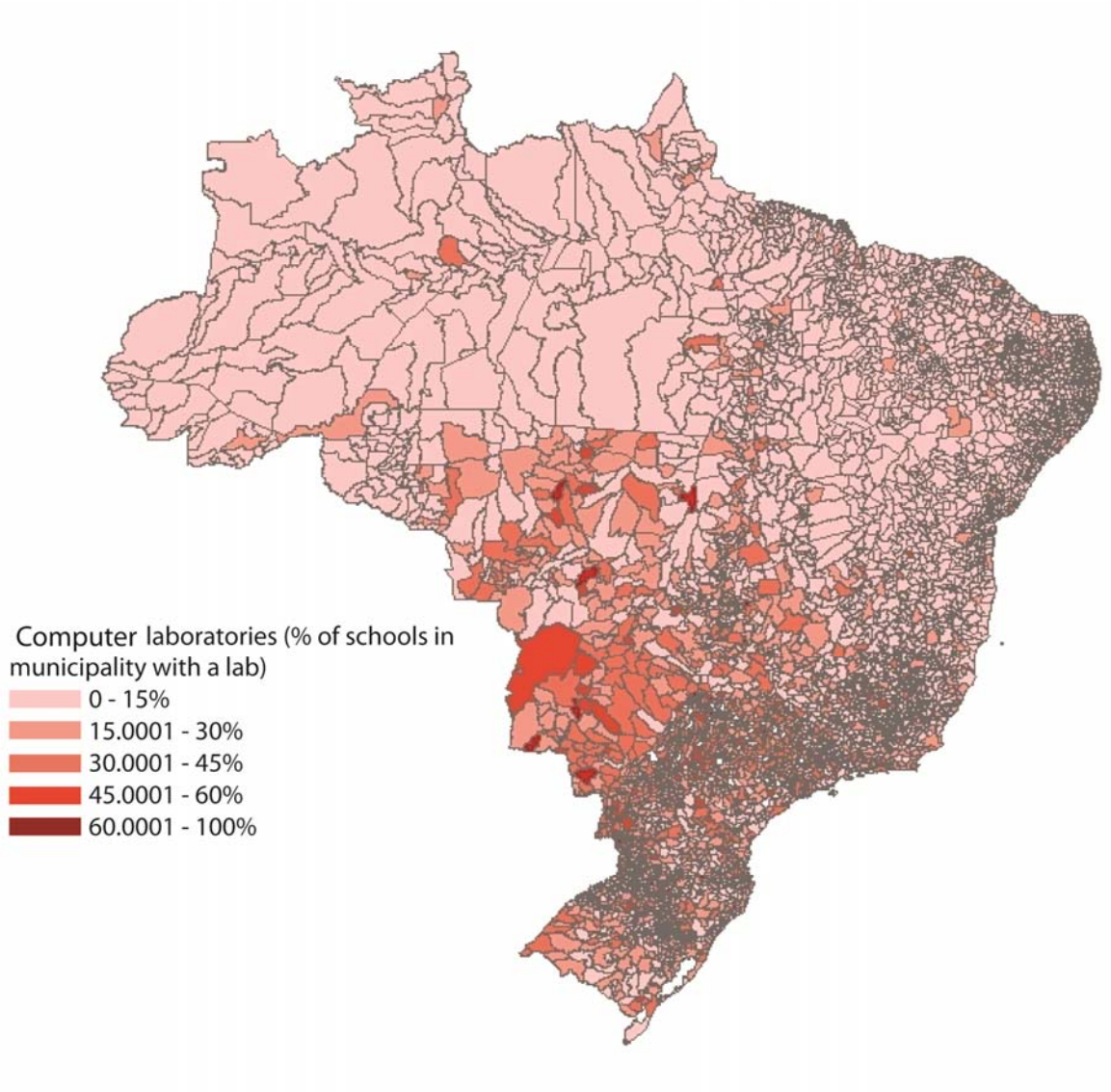

Figure 7: Schools with computer labs

Non-educative resources

Schools can also have inputs that may not directly impact education, but can improve quality of life for children. Things that provide better nutrition, an opportunity

for physical activity and playtime, or a more comfortable sanitary facility may improve both children's experience at the school as well as the school's ability to hire good teachers in a positive working environment.

Kitchens and the provision of food for students are prevalent in Brazilian schools: 69.68% of schools have a kitchen on campus or in the building, and 70.01% provide food. In Figure 8, it's evident that while select Northeastern and Northern states systematically lack kitchens, other states in these regions show consistently high averages of school kitchens in their municipalities. Interestingly, however, Northern states with low averages of kitchens in schools have very high averages of availability of food for students – between 60 and 100% of schools offer this service in almost every municipality. Once again, Mato Grosso do Sul displays the highest consistency of the highest averages of availability of both inputs.

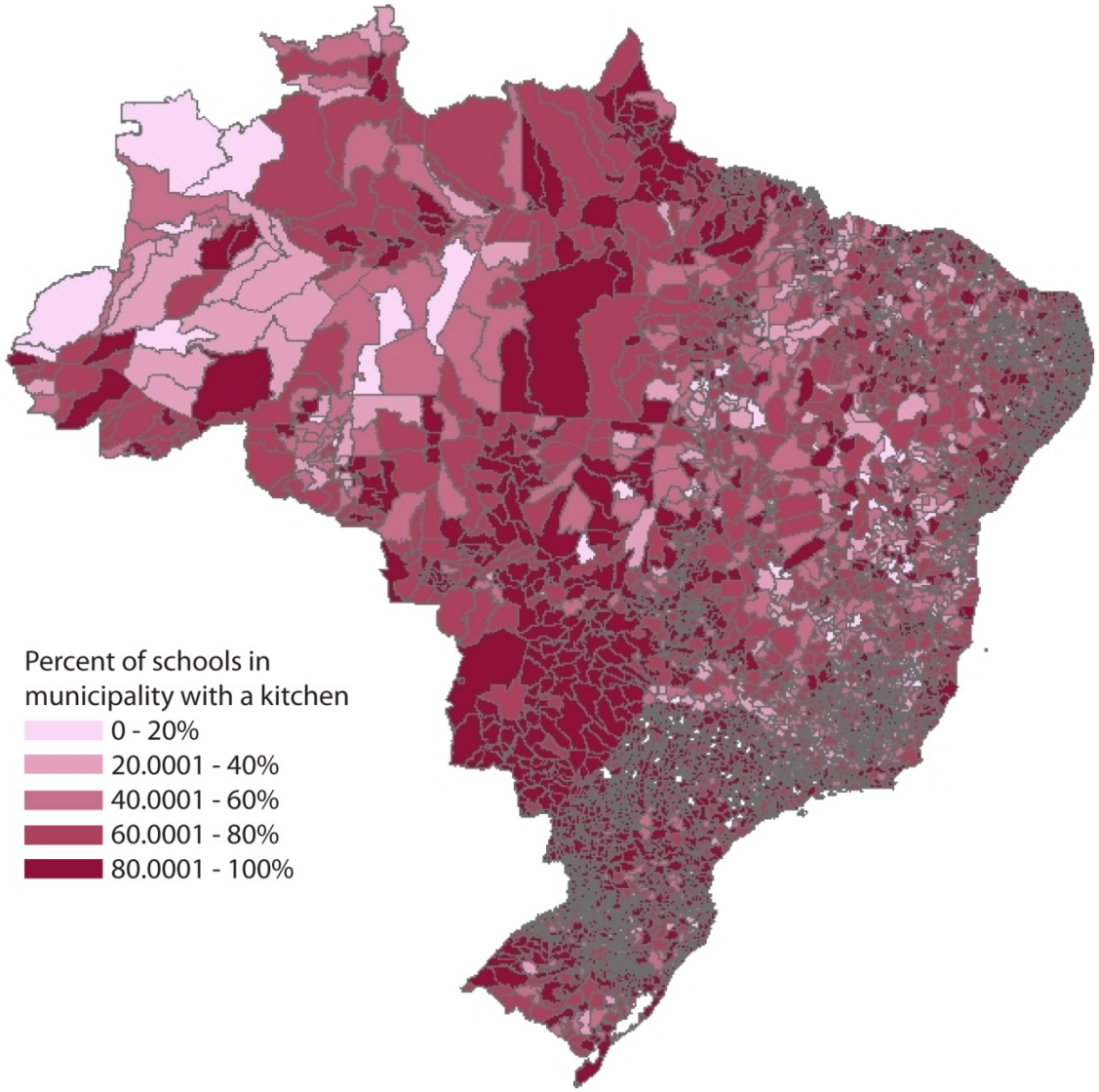

Figure 8: Schools with kitchens

Playgrounds and sports fields are less common. 21.53% of schools have playing fields for sports, while 18.92% of schools have playgrounds. These two show similar patterns, a pattern demonstrated in the map of playing fields in Figure 9. Both inputs tend to be clustered in the South region and Mato Grosso do Sul, while other regions,

including the Southeast, tend to have a moderate to small amount of playing fields and playgrounds available at schools.

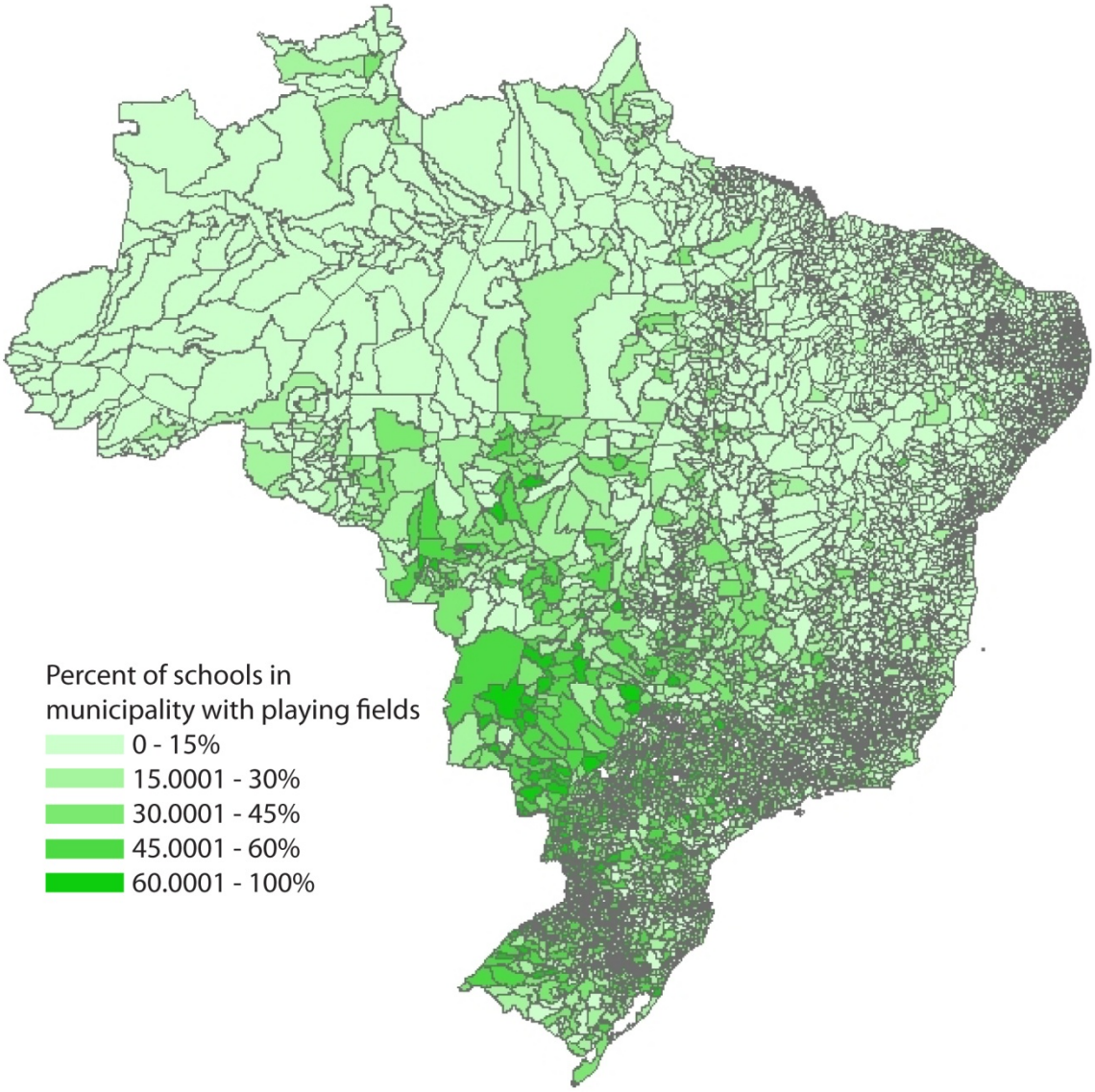

Figure 9: Schools with playing fields

66.5% of all Brazilian schools have indoor bathrooms, dispersed across the country. The states of Amazona, Acre, and surprisingly Mato Grosso do Sul have a low prevalence of indoor bathrooms. Mato Grosso do Sul's low averages may be due to a data error, however, given that all its municipalities report an average of 0 or 1, rather than between the two extremes. The rest of the country tends to have high averages of indoor bathrooms in most muncipialities. The western part of the Northeast region does show, however, more municipalities with fewer indoor bathrooms than the other regions. Figure 10 shows these patterns below.

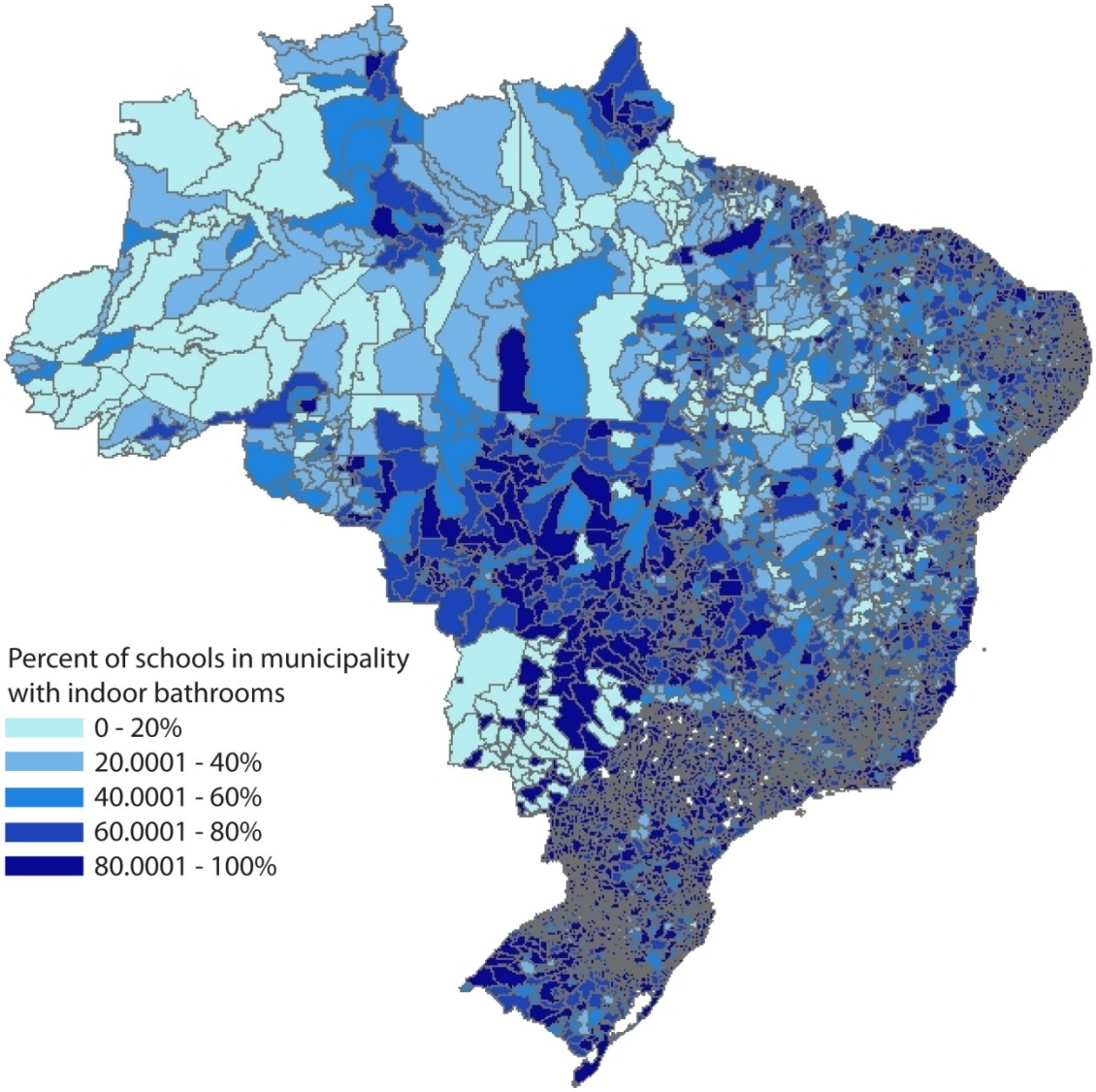

Figure 10: Schools with indoor bathrooms

Technological resources

Brazilian schools have clearly made an investment in technological resources for schools. Many of these resources are available for nearly half of all schools, an important figure given the low amount of other resources available. 53.57% of Brazilian schools

have TVs, 38.9% VCRs, 48.82% DVD players, and 18.65% parabolic antennas. Figure 11 shows the average number of schools with TVs by municipality, which will represent all of these variables given the necessity of a TV for the use of things like a DVD player.

Figure 11 shows that North and Northeast schools rarely have TVs available. While they are more available in the South and Southeast, there are still many municipalities without TVs, while the Central-West region tends to have a moderate to high average of schools with TVs.

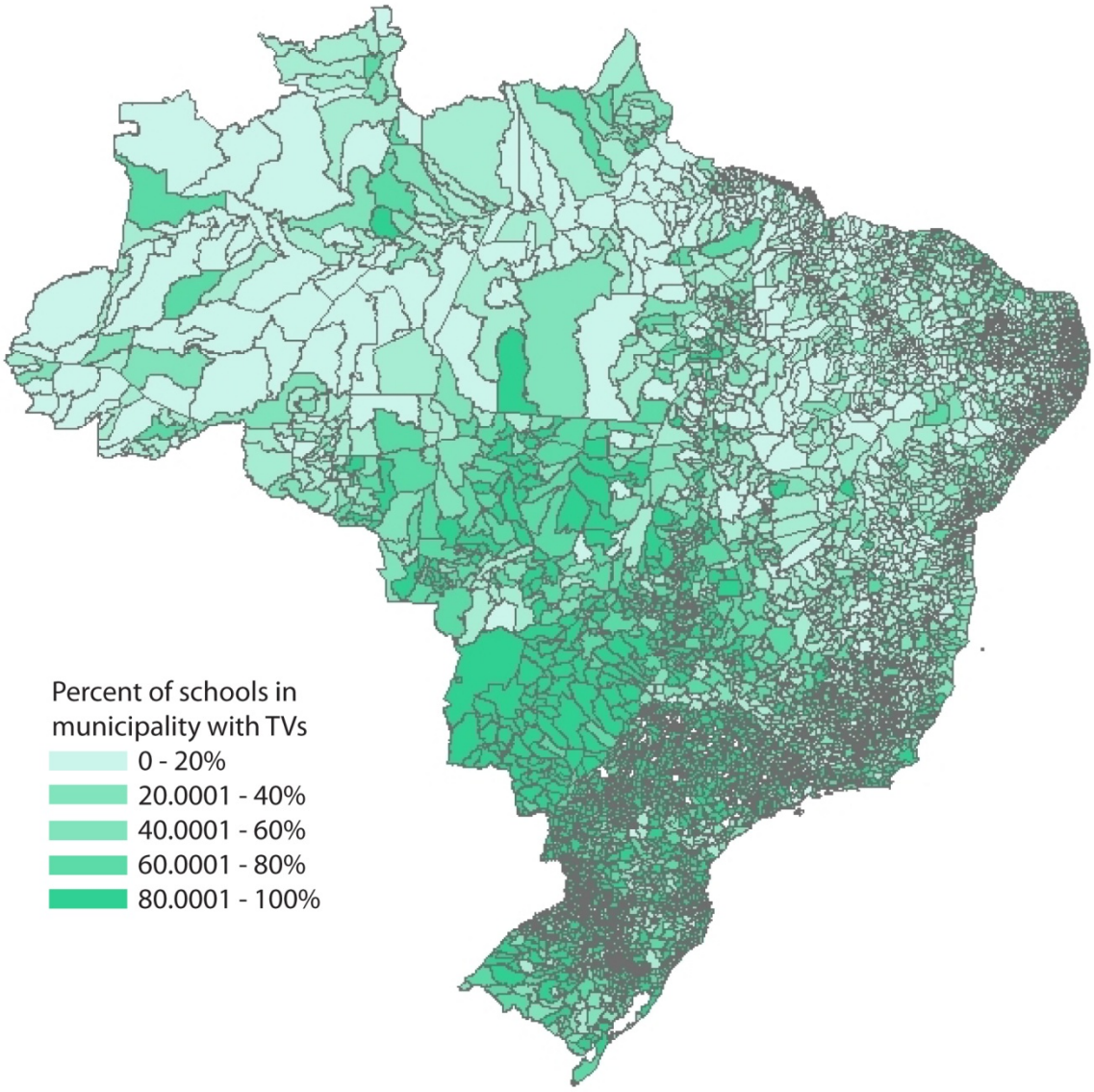

Figure 11: Schools with TVs

Other technological inputs are also relatively common. 40.5% of Brazilian schools have printers, while 21% have copiers. Below, Figure 12 shows the average percentage of schools in a municipality that have printers. The North and Northeast regions have very few printers available in schools. In the Southeast and South, the states

of São Paulo and Paraná have a moderate to high amount of printers available, while the Central-West region has the highest averages of printers available.

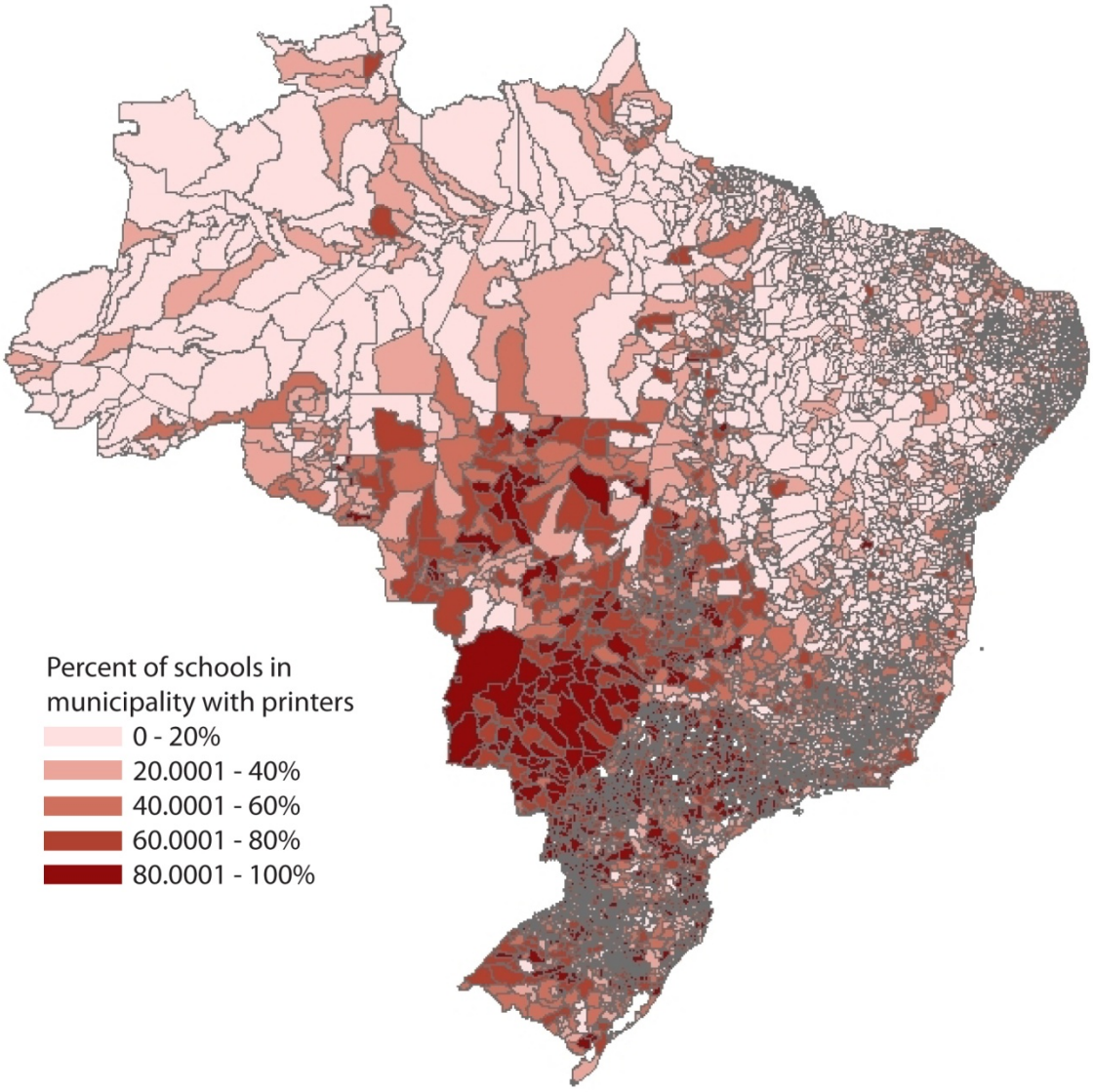

Figure 12: Schools with printers

Computera and Internet access are also relatively common in Brazilian schools. 43.13% of all schools have computers, and 28.34% have Internet access. Computer

access is still largely confined to the same regions that report high amounts of other inputs however – the Northeast and Northern regions have some scattered municipalities with high averages of schools with computers, but otherwise little access. The South and Southeast regions have moderate access with some scattered high average municipalities, with the states of São Paulo and Paraná reporting high averages of schools with computers. The Central-West region has moderate to high access across almost all municipalities, with Mato Grosso do Sul reporting the most consistently high averages in Brazil. Figure 13 shows this distribution below.

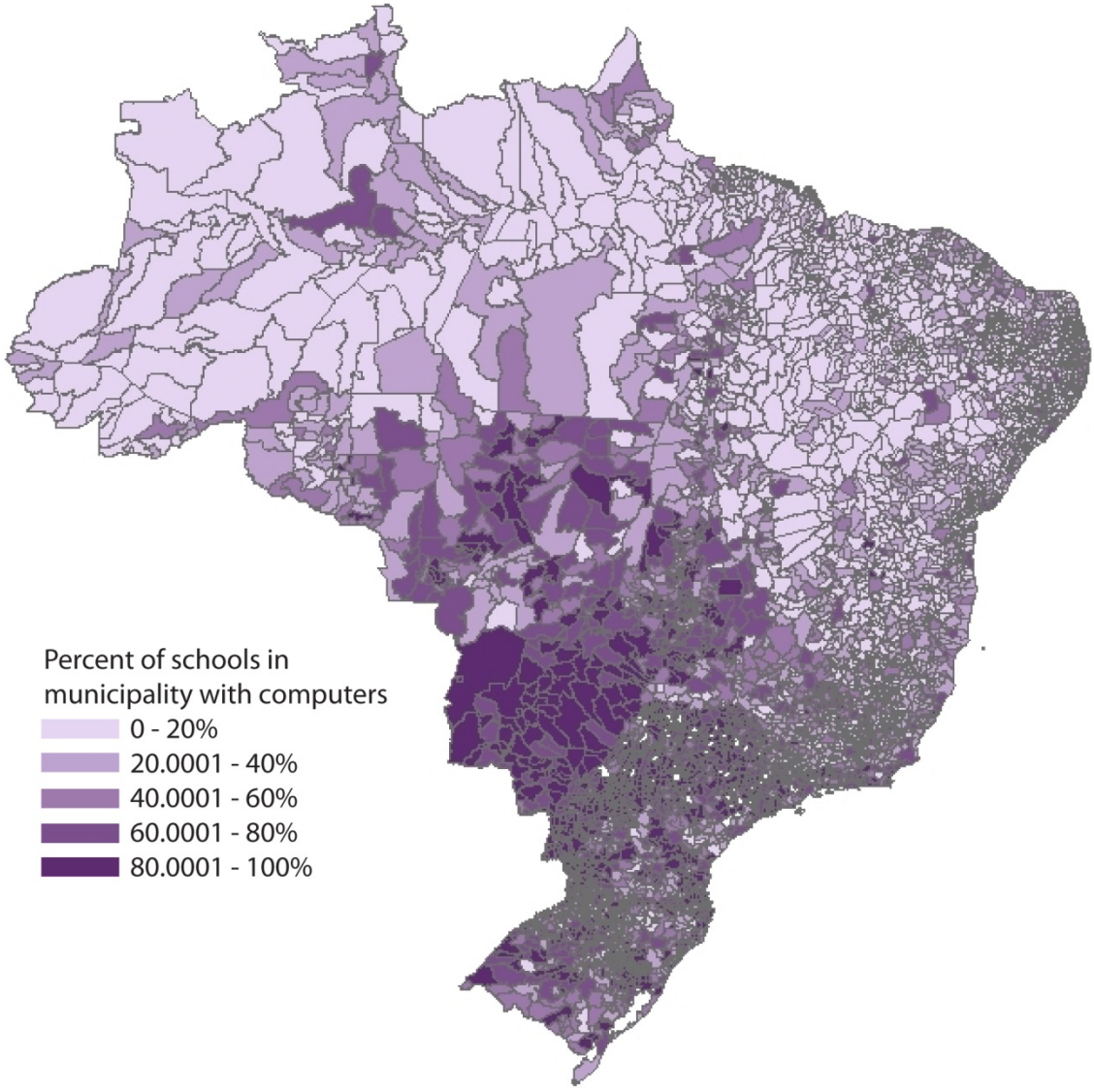

Figure 13: Schools with computers

Resources for special populations

Very few schools in Brazil devote any resources to special populations, such as the indigenous, quilombo residents, and the mentally and physically disabled. Below,

Table 4 shows national averages for various indicators on these resources or instruction. Note that for these variables, 19.8% of schools did not respond.

Variable	Percentage of schools nationally offering this instruction or facility
Instruction for diverse groups	2.23%
Instruction on quilombola culture	0.35%
Instruction on indigenous culture	0.49%
Instruction for the blind	0.75%
Instruction for the deaf	0.96%
Education for the indigenous	1.08%
Instruction in indigenous languages	0.76%
Bathrooms for the disabled	10.2%
Other facilities for the disabled	8.25%
Special education for any age	2.72%

Table 4: National averages of resources for special populations

Instruction offered

Brazilian schools offer instruction for a variety of ages and groups. 34.46% of schools offer an 8 year fundamental education, while 40.06% offer a 9 year fundamental education, with 19.8% schools not reporting. 42.52% of schools offer preschool, and another 12.04% offer secondary school. 16.78% offer remedial education for youth and adults, primarily for fundamental education, and 2.72% teach special education courses for a variety of ages.

OVERALL PATTERNS

Overall, it becomes clear that basic inputs, like public servicing, materials for basic education instruction, and food for students are in place in a majority of Brazilian schools across the nation. Technological inputs are also relatively common, although not

as widespread, and although this data does not show whether training programs to make these inputs have a positive impact on students are in place.

Some technological inputs, like the Internet, are still uncommon. Many facilities are also rare, including educational facilities like science and technology labs, as well as non-educational ones like playground and sports fields. Schools also lack specialized education, whether for the mentally or physically disabled or for ethnic and cultural groups within Brazil's population. Also discouraging is the high percentage of schools using only one room, indicating possible multi-grade classrooms.

In terms of regional patterns, the Northern and Northeastern regions are systematically disadvantaged in terms of school inputs. The South and Southeast appear to have better-funded schools than those in the North in almost every regard, including very basic inputs like power and water, which schools in the North region sometimes lack. Interestingly, the Central-West region schools had moderate to high averages in many inputs, especially the state of Mato Grosso do Sul.

The regional distribution of *Bolsa Família* recipient students may, then, affect what inputs emerge in the following chapter's analysis of school inputs for welfare students, if recipients tend to be clustered in low-funding regions like the North and Northeast.

Chapter 5: *Patterns of School Inputs for Bolsa Família Recipient Students*

To begin to understand materials and facilities available to *Bolsa Família* recipient students, an analysis of the matched database of school inputs and welfare information demonstrates what types of schools tend to be home to clusters of *Bolsa Família* students, and what inputs those schools are most likely to lack. The ability to build any deeper analysis is obstructed by a lack of data and by gaps within existing data.

DESCRIPTION OF DATA

This analysis used two databases produced by the Brazilian government. Data on *Bolsa Família* recipients is collected in the *Cadastro Único,* the MDS' unified registry for social programs. The *Cadastro* focuses on families with a monthly income of less than half of minimum wage for each individual or fewer than three minimum salaries in the family.[67] The 2008 *Cadastro* information used in this study includes several codes to identify a child, and match that child to a family and to statistical records kept by the Instituto Brasileiro de Geografia e Estadística (IBGE). It also includes other identifying information for the child and family – mother's name, address, and birth date – as well as information about what school the child attends and whether the child is receiving *Bolsa Família* funding.

This dataset specifically came from a matched database created from *Cadastro Único* and *Educacenso*, created in 2010 by researchers at the Instituto de Pesquisa Econômica Aplicada (IPEA), a Brazilian government-led research foundation. The two

[67] "Cadastro Único," Ministério do Desenvolvimento Social e Combate à Fome, accessed February 1, 2012, http://www.mds.gov.br/bolsafamilia/cadastrounico.

databases do not share common student IDs, and prior to this matching, research focusing specifically on educational impacts for students receiving *Bolsa Família* was not possible. IPEA researchers matched *Cadastro* information to *Educacenso* information using four separate methods, each using a minimum of three variables such as student name and date of birth to guard against false matches. The resulting database supplies an *Educacenso* student ID number for each child, as well as information on whether the child is receiving *Bolsa Família* funds.

Information on schools was drawn from the 2008 *Educacenso*. The *Educacenso* is an annual census carried out by INEP, in conjunction with several other government agencies of statistics or education, to study the basic educational system and ensure transparency. The resulting databases include extensive information on the four groups targeted: 129 variables for schools, 58 for classes, 56 for students, and 94 for teachers. This study focuses solely on the database available on schools, which includes a spectrum of characteristics and inputs identifying or quantifying location of the school, type of school and funding, material inputs, facilities and public servicing, levels of education offered, and availability of special education programs.

For this study, the IPEA matched database and *Educacenso* school database were unified through a series of steps. First, information on *Bolsa Família* status was added to *Educacenso*'s student database by matching students from the IPEA matched database using student IDs. This step linked student IDs to their schools' respective ID numbers, allowing the data to be aggregated by school to result in a new variable: percent of students receiving *Bolsa Família* in each school. This variable was added to

Educacenso's school database by matching school IDs. The final database used included the 129 original variables from *Educacenso* and the new variable of *Bolsa Família* recipients as a percentage of student population in each school.

ISSUES WITH MISSING DATA

Missing data was a major issue for this study. In every single state in the initial matched database provided by IPEA, only between 50 and 75 percent of *Cadastro* students could be matched. São Paulo presented a particular problem, as only 6.64 percent of Paulista *Cadastro* students could be matched.

These gaps in data only became more pronounced with the additional two matching steps and aggregation described in the previous section. Below, Table 5 shows the total percentages of missing values in the final database. The variable whose missing values are here considered is the percentage of *Bolsa Família* recipient students in a school.

State	Total # of schools	# of missing schools	Percent missing
Acre	1738	459	26%
Alagoas	3357	367	11%
Amapá	798	269	34%
Amazonas	5389	1811	34%
Bahia	21784	2336	11%
Ceará	10912	2022	19%
Distrito Federal	1087	287	26%
Espírito Santo	3730	947	25%
Goiás	4488	1025	23%
Maranhão	14111	1949	14%
Mato Grosso	2712	714	26%
Mato Grosso do Sul	1610	485	30%
Minas Gerais	17932	4577	26%
Pará	12438	2607	21%
Paraíba	6537	689	11%
Paraná	9202	2781	30%
Pernambuco	10668	1064	10%
Piauí	7308	914	13%
Rio do Janeiro	10404	3232	31%
Rio Grande do Norte	4355	790	18%
Rio Grande do Sul	10031	2040	20%
Rondônia	1651	409	25%
Roraima	718	314	44%
Santa Catarina	6767	2639	39%
São Paulo	26413	25475	96%
Sergipe	2499	317	13%
Tocantins	2039	485	24%

Table 5: Missing values by state

The majority of schools are missing between 20 and 35 percent, while three states with a relatively high percentage of missing schools are highlighted in red. São Paulo, missing 96 percent of its information, is unusable. The loss of this data occurred in IPEA's initial matching of *Educacenso* and *Cadastro Único*.

Interestingly, most states in the Northeastern Region have significantly lower percentages of missing values – between 10 and 20 percent. These states are highlighted in green in Table 5. It is unclear what causes this, and may indicate that nationwide analyses using these matched databases will have a systematic bias as a result.

Overall, after matching and aggregating, the final database included 138,735 schools, compared to a total 250,376 schools in Brazil in 2008. As this only represents 55.4 percent of Brazil's total schools, any resulting analysis may be very weak.

OTHER DATA ISSUES

The data may also be biased if non-*Bolsa Família* students are somehow left out of the calculation of the school's percentage of welfare recipient students. In the analysis, student bodies of 75 percent or more *Bolsa Família* recipient students made up approximately 81 percent of the schools in the database. Given that *Bolsa Família* reaches only an estimated quarter of Brazil's population, it is not likely that this is an accurate measure of student bodies. It is unclear whether non-welfare students have been left out of the databases, somehow, or if the schools that were dropped from analysis due to missing values tended to be schools with low percentages of *Bolsa Família* recipient students.

METHODOLOGY

Given the size of the dataset and the constraints imposed by missing data and a possible overcounting of welfare students, this study focused on data clusters and decision trees, rather than in-depth analysis. Finding clusters and mapping trees will help to conceptualize the data and to understand what patterns of school inputs exist for *Bolsa*

Família recipient students. Knowing these patterns could reveal whether the inputs these students lack are those that have been shown by other studies to have a high impact on educational achievement.

For this analysis, a technique called Classification and Regression Trees (CART) was used. Using a target variable, CART analysis creates a decision tree that shows which variables have the highest impact or are most important for explaining the target. CART is also not limited by intercorrelations among variables, which are likely to be common in educational data, and can reveal these interactions.[68] For this study, CART analysis was executed using two software packages, SAS Enterprise Data Miner and Salford Predictive Model Builder.

To prepare the data for CART analysis, several variables were dropped, based on their irrelevance to the topic or a high percentage of missing values. These variables included structural things like regional agency overseeing the school and state, and overly detailed variables, like specific indigenous language spoken. The target variable, percentage of students receiving *Bolsa Família* funds, was also simplified to facilitate the tree-building process. In order to mitigate the impact of the overcounting of welfare students, the new target variable considered all schools whose welfare recipient population made up 82.3% or more of their student population to be a 1, and all others a 0. This value was chosen because it allowed 25% of the schools to be considered non-*Bolsa Família* schools.

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[68] Yisehac Yohannes and John Hoddinott, "Classification and Regression Trees: An Introduction," *Technical Guide #3* (Washington D.C., International Food Policy Research Institute, 1999), 1-2., 10-11

RESULTS

A variety of different trees were produced by these two software packages, depending on what variables were included. In order to link the analysis to the maps in Chapter 4, several trees included the state variable. The other trees did not include any locational information other than a school's status as urban or rural, in order to focus on the inputs themselves.

States and *Bolsa Família* recipients

CART analysis using a dataset that included state information consistently produced trees that divided Brazil's 26 states into two large groups. One of these groups was subdivided again, resulting in three groups that largely mirror Brazil's regional divides. The state variable's position as creator of the top splits in the tree means that a school's location in a particular state is the predominant influencing variable in its percentage of *Bolsa Família* recipient students. The tree omitted São Paulo state from these splits, likely because of its high number of missing target variable values. Below, Figure 14 shows these three groups. Note the comparison between geographic location of schools with a higher prevalence of *Bolsa Família* students and the maps in Chapter 4 showing patterns of inavailability of school materials and facilities in those same regions.

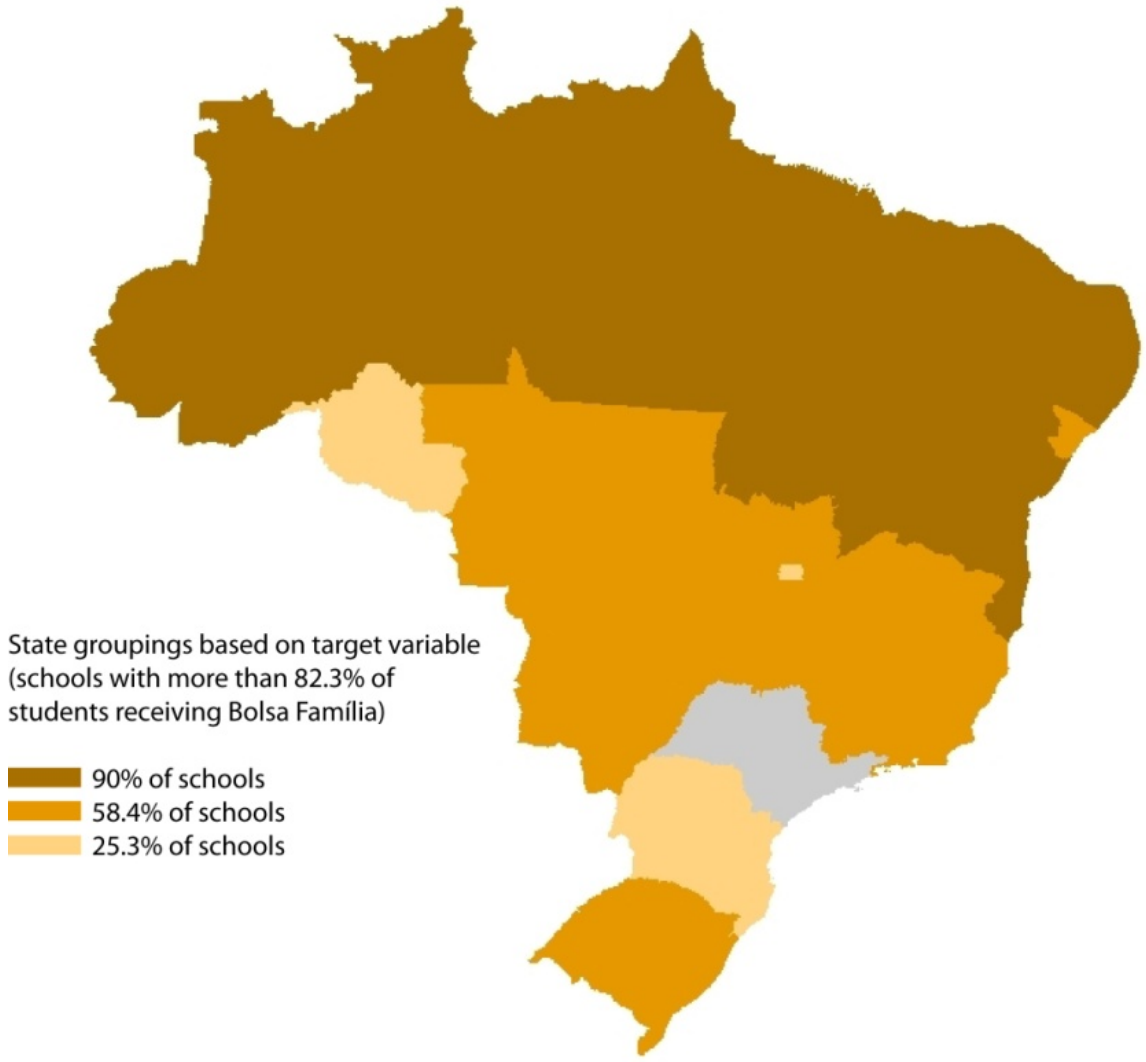

Figure 14: Percentage of schools with high prevalence of welfare-recipient students by state

Trees 1 and 2: All binary and numeric input variables included

This tree was built from a dataset with 119 variables, including all binary and numeric input variables that were not simply identification variables for a school.

Tree 1: Salford

This tree was run on Salford Predictive Model Builder, and was built from representative sample of 98,304 records. 85.82% of the schools in the sample presented a 1 on the target variable of *Bolsa Família* population percentage. After running 11 trees and testing each, the software yielded a tree with 23 nodes as the optimum tree.

Variables' importance was scored, based on how frequently a variable was used to describe schools with high percentages of welfare recipient students. The variables scoring high in importance for Tree 1 are represented in Table 6 below:

Variable	Score (out of 100)
Administrative dependence	100
School has Internet	72.79
Private school category	72.71
School has printer	65.41
Location (urban or rural)	59.5
Number of students receiving specialized education from another school	17.32
School offers food for students	16.32

Table 6: Variable importance scores in Tree 1

The graphic representation of the tree shows the most common values for each of these important variables, shown in Table 7:

Variable	Value with higher prevalence of welfare recipient students
Administrative dependence	Municipal
School has Internet	No
Private school category	School can select students and requires tuition payments to attend
School has printer	No
Location (urban or rural)	Rural
Number of students receiving specialized education from another school	Fewer than 8.5
School offers food for students	Yes

Table 7: Values of important variables for schools with high prevalence of welfare recipients

The visual representation of the tree also emphasizes average number of computers per student as a major splitter, with many welfare recipient-prevalent schools having more than 0.03 computers per student.

Tree 2: SAS

This tree was built from a dataset with 119 variables, including all binary and numeric input variables that were not simply identification variables for a school, and was run on SAS Enterprise Data Miner. The software chose all 138,735 records for analysis, with 75.06% presenting a 1 on the target variable of *Bolsa Família* population percentage. The resulting tree had 18 leaves, to maximize accuracy while also maximizing number of nodes.

Variables scoring high in importance are shown below in Table 8:

Variable	Score (out of 100)
School has Internet	100
School has playground	41.1
School has science lab	27.5
Administrative dependence	23.7
School recycles	18.7
School offers regular instruction for 8 years of primary education	13.4
Indigenous language spoken in school	13
School has copier	13
School offers fundamental education for youth and adults (remedial/returning to school)	12.9
School offers regular instruction	11.6
Number of existing rooms	10.7

Table 8: Variable importance scores for Tree 2

The values for these important variables are shown in Table 9:

Variable	Value with higher prevalence of welfare recipient students
School has Internet	No
School has playground	No
School has science lab	No
Administrative dependence	Municipal
School recycles	No
School offer regular instruction for 8 years of primary education (9 years is mandatory and a separate variable)	No
School offers instruction in indigenous languages	Yes
School has copier	No
School offers fundamental education for youth and adults (remedial/returning to school)	Yes
School offers regular instruction	Yes
Number of existing rooms	Fewer than 13.5

Table 9: Values of important variables for Tree 2

Trees 3 and 4: Textbook variables dropped

These trees were built from a dataset with 104 variables, including all binary variables but without the raw numeric variables that represented number of textbooks returned and reused. The textbook variables were dropped for two reasons: one, these variables were often missing for many schools; and two, these numbers are largely meaningless if not represented in terms of the number of students attending the school in that particular grade.

Tree 3: Salford

The tree was run on Salford Predictive Model Builder, and used a representative sample of 112,347 records, with 82.9% presenting a 1 on the target variable of *Bolsa Família* population percentage. After running 26 trees and testing each, the software yielded a tree with 122 nodes as the optimum tree.

Variables scoring high in importance are represented in Table 10 below:

Variable	Score (out of 100)
School has Internet	100
Administrative dependence	89.29
Location (urban or rural)	73.55
Private school type	64.25
School offers food for students	55.68
Number of students receiving specialized education in another school	40.35
Number of students receiving specialized education	21.4
Average number of administrative computers per staff member	20.67
Number of existing rooms	18.83
Average number of student-use computers per student	18.08
School is connected to public sewage network	15.09
School has copier	12.41
School has printer	12.26
School has computers	10.74

Table 10: Variable importance scores in Tree 3

The values for variables scoring high in importance are shown in Table 11:

Variable	Value with higher prevalence of welfare recipient students
School has Internet	No
Administrative dependence	Municipal
Location (urban or rural)	Rural
Private school type	Community
School offers food for students	Yes
Number of students receiving specialized education in another school	Fewer than 2.5
Number of students receiving specialized education	Fewer than 2.5
Average number of administrative computers per staff member	More than 0.003
Number of existing rooms	Fewer than 2.5
Average number of student-use computers per student	Fewer than 0.028
School is connected to public sewage network	No
School has copier	No
School has printer	No
School has computers	No

Table 11: Values of important variables for Tree 3

Tree 4: SAS

This tree was run with SAS Enterprise Data Miner and included all 138,735 records, 75.06% of which were a 1 on the target variable of *Bolsa Família* population percentage. The tree with maximum accuracy and information had 17 leaves.

Variables scoring high in importance are shown below in Table 12:

Variable	Score (out of 100)
School has Internet	100
Average number of administrative-use computers per school in municipality	45.7
School has science lab	27.5
Administrative dependency	18.5
School has retro projector	17.1
School recycles	15.4
School has playground	15.37
Number of existing rooms	10.8
School has copier	18.83

Table 12: Variable importance scores in Tree 4

The values for variables scoring high in importance are shown in Table 13:

Variable	Value with higher prevalence of welfare recipient students
School has Internet	No
Average number of administrative-use computers per school in municipality	Fewer than 0.005
School has science lab	No
Administrative dependency	Municipal
School has retro projector	No
School recycles	No
School has playground	No
Number of existing rooms	Fewer than 10.5
School has copier	No

Table 13: Values of important variables for Tree 4

Trees 5 and 6: Textbook, room, and private school variables dropped

These trees were built from a dataset with 95 variables, including all binary variables but without the raw numeric variables that represented number of textbooks returned and reused, number of rooms existing and used, and the five variables pertaining to type and funding of private schools. Room variables were dropped based on the

inability to gauge how many students and how many grades were being taught in those rooms. Private school variables were dropped based on an assumption made by other scholars that few *Bolsa Família* students attend private schools. This may make it an attractive splitting decision for the software, but an inappropriately important one. Discussion of dropping the textbook variables can be found in the subsection above.

Tree 5: Salford

The tree was built using Salford Predictive Model Builder from a representative sample of 122,881 records, with 78.48% presenting a 1 on the target variable of *Bolsa Família* population percentage. After running 31 trees and testing each, the software yielded a tree with 93 nodes as the optimum tree.

Variables scoring high in importance are represented in Table 14 below:

Variable	Score (out of 100)
School has printer	100
School has Internet	78.92
School has information lab	50.93
School has high speed Internet	43.28
Average number of administrative computers per staff member	24.5
School has computers	20.81
School has periodic garbage collection	16.47
Location (urban or rural)	12.41
Average number of student-use computers per student	11.11

Table 14: Variable importance scores in Tree 5

The values for these important variables are shown in Table 15:

Variable	Value with higher prevalence of welfare recipient students
School has printer	No
School has Internet	No
School has information lab	No
School has high speed Internet	No
Average number of administrative computers per staff member	More than 0.003
School has computers	No
School has periodic garbage collection	No
Location (urban or rural)	Rural
Average number of student-use computers per student	Fewer than 0.028

Table 15: Values of important variables for Tree 5

Tree 6: SAS

The tree was built using SAS Enterprise Data Miner using all 138,735 records, with 75.06% presenting a 1 on the target variable of *Bolsa Família* population percentage. The tree with maximum accuracy and information had 18 leaves.

Variables scoring high in importance are represented in Table 16 below:

Variable	Score (out of 100)
School has Internet	100
Average number of administrative-use computers per school in municipality	45.7
School has science lab	27.5
School has retro projector	17.1
School has playground	15.4
School has copier	13.6
School recycles	11.9

Table 16: Variable importance scores in Tree 6

The values for these important variables are shown in Table 17:

Variable	Value with higher prevalence of welfare recipient students
School has Internet	No
Average number of administrative-use computers per school in municipality	Fewer than 0.005
School has science lab	No
School has retro projector	No
School has playground	No
School has copier	No
School recycles	No

Table 17: Values of important variables for Tree 6

Overall tree results

Both software packages, Salford Predictive Model Builder and SAS Enterprise Miner, highlighted the same or similar variables as important for determining which data points would have high prevalence of welfare recipients. Interestingly, the results from SAS were more consistent in selecting variables of importance regardless of what variables had been removed from the dataset, while Salford's trees were more extensive and assigned higher scores of importance overall.

In general, technological inputs tended to be important in splitting decisions for all trees, indicating that schools with high proportions of welfare recipients tend to lack technological inputs more often than schools without this high proportion. Schools also appear to be smaller, rural, and usually run and funded by municipalities. Most offer instruction for the mandatory 9 years of schooling, some instruction for youth and adults returning to school, but little specialized instruction. *Bolsa Família* recipients also tend to attend schools that serve food for students. Unfortunately, no appropriate textbook

variables were available to demonstrate whether this basic and important input was available for welfare students.

Overall inputs

Table 18 shows the percent of schools with a majority of *Bolsa Família* recipient students that have various school inputs or characteristics, to establish in general what sort of inputs may be lacking for welfare students across Brazil. This is compared to all schools in Brazil, in the right column.

	Schools with 82.3% *Bolsa Família* recipients or more	**All schools**
Rural location	61.64%	47.47%
In a school building (not shared)	92.28%	73.87%
Administrative office	50.23%	48.6%
Teachers' lounge	36.2%	37.04%
Computer lab	17.63%	21.01%
Science lab	4.95%	7.19%
Kitchen	85.88%	69.68%
Library	28.62%	29.98%
Playground	9.91%	18.92%
Bathroom inside building	77.03%	66.5%
Only one classroom used	26.71%	20.74%
Television	53.97%	53.57%
Printer	36.29%	40.55%
Computer(s)	39.53%	43.13%
Internet	19.91%	28.34%
Food served for students	98.03%	70.01%
Regular teaching for mandatory education available	61.34%	77.78%
Special education available	2.89%	2.72%
Youth and adult education available	27.5%	16.78%
Teaching for diverse groups available	2.43%	2.23%

Table 18: School inputs for schools with a large welfare recipient population versus all schools

Validity test

Given the data issues outlined earlier in the chapter, it may not be clear how reliable the above trees are. In order to test the validity, input averages for two states from disparate regions with lower percentages of missing data are placed into a table for comparison with the aggregate welfare recipient data from Table 18. Ceará in the Northeast region is missing 19% of its schools, while Minas Gerais in the Southeast region is missing 26% of its schools.

Table 19 shows these percentages:

	Ceará	**Minas Gerais**	**Schools with 82.3% *Bolsa Família* recipients or more**
Rural location	58.06%	43.24%	61.64%
In a school building (not shared)	68.01%	60.65%	92.28%
Administrative office	44.77%	40.87%	50.23%
Teachers' lounge	25.5%	35.06%	36.2%
Computer lab	14.07%	19.2%	17.63%
Science lab	4.33%	7.13%	4.95%
Kitchen	63.22%	59.88%	85.88%
Library	28.82%	33.62%	28.62%
Playground	12.52%	17.52%	9.91%
Bathroom inside building	68.95%	60.11%	77.03%
Only one classroom used	16.76%	11.79%	26.71%
Television	63.39%	79.86%	53.97%
Printer	37.16%	60.09%	36.29%
Computer(s)	41.02%	63.72%	39.53%
Internet	23.7%	43.71%	19.91%
Food served for students	86.35%	85.87%	98.03%
Regular teaching for mandatory education available	79%	74%	61.34%
Special education available	1.55%	2.74%	2.89%
Youth and adult education available	31.54%	15.7%	27.5%
Teaching for diverse groups available	2.4%	2.6%	2.43%

Table 19: Inputs for welfare students in Ceara, Minas Gerais, and Brazil at large

Based on patterns shown in Chapter 4 for Brazil at large, as well as the regional pattern of welfare recipients shown in Figure 14 in this chapter, it is not surprising that schools serving a majority welfare recipient population in Minas Gerais have more availability of many inputs than Ceará or the national average for welfare students. In general, there are some differences due to the greater economic development of Minas Gerais in relation to most states, and of both Ceará and Minas Gerais in relation to some of the extremely poor states in the North and other parts of the Northeast. However, the percentages for these two very different states still remain relatively close to the welfare recipient nationwide average. This indicates that the patterns drawn from previous trees and tables are valid, despite the weaknesses of the data.

OVERALL PATTERNS

First, Table 18 above showed that there are two notable differences between schools where a majority of students receive *Bolsa Família* funds and all schools. More *Bolsa Família* recipients attend rural schools than all Brazilian students at large, and *Bolsa Família* recipient students are far more likely to receive meals at school than the average Brazilian student. The higher prevalence of school meal programs for welfare recipients is likely due to other programs within *Bolsa Família* that target nutrition, outside of the conditional cash transfer component.

However, and most importantly, the states in Figure 14 that were indicated as having a high frequency of schools with large populations of *Bolsa Família* recipient students were all states that in Chapter 4 were shown to be systematically disadvantaged in terms of school inputs. This includes all school inputs, from basic to technological to

facility to instruction. The aggregated averages of inputs for all welfare students also demonstrated that they are less likely to have access to inputs. As such, it is evident that a majority of welfare-recipient students may be attending schools that lack many inputs, some of which are important for achievement.

The inputs that are most frequently lacking in schools with high numbers of *Bolsa Família* recipient students tend to be those that do not have significant impact on educational outcomes. Food programs for students in a school, location and administrative dependence, and specialized education programs all consistently appeared in multiple trees. These inputs, while they may indicate something important about the socioeconomic class of the students or about the overall funding of the school, are not in and of themselves inputs that have an effect on achievement.

Technological inputs were also frequently lacking. This includes everything from basic technological inputs that are likely more administrative, like copiers, printers, and administrative computers, to inputs that might more directly affect student learning, like student computers and Internet access. Studies have not shown a clear relationship between technology and achievement, but did indicate that these inputs might be leveraged to provide better education for students attending low-quality schools, or students from low-income families. This is important for *Bolsa Família* recipients, who are inherently from low-income families, and may also be attending low-quality schools.

Chapter 6: *Conclusions and Recommendations*

Brazil's commitment to education has led to extensive national coverage and basic education rates. In 2008, the adult literacy rate was 90%, while the youth literacy rate was 97.8%. Primary and secondary enrollment rates are over 100% due to enrollment of students older than the normal age range and due to grade repetition. However, these rates have been decreasing back to 100% in recent years, indicating that fewer and fewer children are being held back or are in remedial education beyond the normal age for that grade. Repetition rates, however, are still high – 18.67% of the total primary enrollment will repeat, and 21.07% of total secondary enrollment as well. Persistence to the last grade of primary school could also improve: only 75.71% of each cohort will persist all the way through.[69]

Brazil's *Bolsa Família* has improved enrollment and grade promotion and made progress on equalizing the racial composition of enrollment.[70] The program also has likely contributed to the progress made on the indicators cited above. The question, however, remains: Do the schools that Brazilian students attend have the capacity to facilitate their education? Beyond that question lies another: Are *Bolsa Família* students attending schools with inferior resources, and if so, does that affect their performance?

This study sought to create a picture of the school resources available in Brazilian schools and more specifically to welfare-recipient students. Literature on school inputs indicates that many school resources have little effect on student performance and

[69] "World Bank: Data Catalog."
[70] Glewwe and Kassouf, "Impact on Enrollment."

achievement, meaning that if a lack of these resources emerged in this study, it likely does not indicate a significant disadvantage or an area in which Brazil should invest. Coupling that knowledge with this broad map of school inputs could indicate whether the Brazilian government would be wise to invest in school resources for their students, or whether that investment would not be cost-effective or influential on student achievement.

Mapping school resources for all Brazilian schools revealed several key findings. First, the kind of inputs that have consistent effect on student performance tended to be present in most Brazilian schools. This includes basic infrastructure like school buildings and utilities, instruction for a full 8 or 9 years at the least, and textbooks (although this final input could not be mapped). Libraries, however, were present in a paltry few schools. Second, ICT inputs, such as computers and the Internet, are highly prevalent, although not present in a majority of schools, and likely to continue growing. Third, more complex infrastructure or expensive inputs were not available in a majority of schools. Also, very few Brazilian schools offer any sort of specialized education, whether it be for the physically disabled, the mentally disabled, or special cultural and ethnic groups within Brazil's population.

Finally, there was an extremely strong regional pattern for almost all inputs. The South and Southeast had consistently moderate to high averages in most inputs, with the South showing higher averages. The Central-West region had mixed performance, but Mato Grosso do Sul repeatedly had the highest and most consistent averages of input availability in schools for nearly every inputs. The North and Northeast regions

continually demonstrated much lower averages than the rest of the country for almost every input, including some of the basic ones like power and water for a school, basic facilities, and instruction offered. This is important, given that most of the welfare students in the database were attending schools in these two regions.

Using CART analysis to determine which inputs were most important or recurred most often for *Bolsa Família* recipient students demonstrated that technological inputs like copiers, printers, computers, and Internet are systematically absent from schools with a high volume of welfare recipients. Food programs for students in a school also showed up multiple times as an important indicator. Finally, location and administrative dependence were consistent – according to this dataset, most *Bolsa Família* recipients are attending municipal schools, and many of them live in rural areas. Overall, the most important or highest impact variables were those that likely do not have a significant impact on student achievement, although ICT inputs could potentially be used to benefit low-income students.

This study also found that there were many flaws in the dataset used to assess school inputs for *Bolsa Família* recipients, such that precluded any deeper analysis. The omission of São Paulo state from the data, as well as the loss of nearly half of Brazil's schools and students after matching limit a researcher's ability to develop a deeper analysis not tainted by any underlying biases in this data gap. The loss of data appeared to be somewhat guided by region, and as stated above, region very much influences the type of school and probably many other aspects of the educative experience.

This study gives a preliminary indication that Brazilian educational funding for school inputs is adequate. The school inputs that have been consistently shown to have an impact on student achievement are available in a majority of schools, which should be improved but will likely not require any high amount of additional funding to do so. Brazil *does*, however, need to focus on the allocation of its resources. The poorest regions have schools that are lacking the most basic resources, not to mention most other resources as well. This is especially important for resource allocation given that most welfare students appear to attend school in these areas, and given that these regions are home to some of the poorer states in Brazil. Increasing enrollment for low-income students in these areas may not actually result in any benefit to them at all, if they are attending a school held in someone's home, or that lacks power, or that has few textbooks.

Brazil should also consider the creation of some sort of central student identification number that can be used to link *Educacenso* data to the *Cadastro Único*, and to other pertinent datasets as well. This would likely fix whatever problem caused the loss of so much data in the matching of the two databases, and would facilitate future study on the results of *Bolsa Família*. It is important that there be some sort of linking factor between the welfare registry and all other datasets. Without these links, studies cannot focus solely on welfare recipients, and it will be more difficult to learn which components of *Bolsa Família* are most successful and which need revamping. This sort of information would benefit Brazil for domestic policy decisions, and would also benefit other countries looking to implement similar social programs.

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Vita

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