The Impact of the *Bolsa Escola/Familia* Conditional Cash Transfer Program on Enrollment, Grade Promotion and Drop out Rates in Brazil

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Abstract

This paper examines the impact of Brazil's *Bolsa Escola* (later renamed *Bolsa Familia*) program on children's progress in school in Brazil. The *Bolsa* program, which started in the 1990s and expanded rapidly in 2001 and 2002, provides monthly cash payments to poor households if their children (between the ages of 6 and 15) are enrolled in school. Using eight years of school census data (from 1998 to 2005), our estimation method compares changes in enrollment, grade advancement and dropout rates across public schools that adopted the *Bolsa* program in different years. We estimate that the *Bolsa* program increased school enrollment in grades 1-4 by about 2.8% in the initial years and by about 5.5% in the long run (after three years). We also estimate that the program reduced the drop out rate for children in grades 1-4 by about 0.3 percentage points in the first year and by about 0.55 percentage points in the long run (after two years), and increased the grade promotion rate by about 0.5 percentage points after one year and by about 1 percentage point in the long run (after two years). Similar results are found for children in grades 5-8. Since only about 43% of Brazilian children are eligible to participate in the program, the impacts of the *Bolsa* program on these education outcomes for the target population (poor families) is arguably at least twice as high as these estimated impacts for the population as a whole.

Key-words: impact evaluation, Bolsa Familia program, primary school

Resumo

O presente estudo analisa o impacto do Programa *Bolsa Escola/Família* no desempenho escolar de crianças no Brasil. O Programa Bolsa, que se iniciou nos anos 90 e se expandiu rapidamente em 2001 e 2002, fornece renda mensal às famílias pobres condicionado aos filhos (entre 6 e 15 anos) permanecerem na escola. Utilizando um painel com 8 anos do censo escolar (de 1998 a 2005), o método de estimação adotado compara mudanças na taxa de matrícula, aprovação e abandono de alunos nas escolas públicas com estudantes recebendo o programa Bolsa com relação as escolas sem alunos recebendo o programa, em diferentes períodos de tempo. Os resultados mostraram que o Programa Bolsa é responsável pelo aumento nas matrículas de 1ª. a 4ª. série em 2.8% no ano inicial e em 5.5% no longo prazo (após 3 anos). Estimou-se ainda que o programa reduziu a taxa de abandono de crianças de 1ª. a 4ª. série em 0.3 pontos percentuais no primeiro ano e em torno de 0.55 pontos percentuais no longo prazo (após três anos), e aumentou a taxa de aprovação em 0.5 pontos percentuais após um ano e em 1 ponto percentual no longo prazo (após dois anos). Resultados semelhantes foram obtidos para crianças da 5ª. a 8ª. série. Uma vez que em torno de 43% das crianças são elegíveis para participar do programa, os impactos do programa *Bolsa Escola/Família* nestes indicadores educacionais para a população alvo (famílias pobres) são pelo menos duas vezes maior do que os impactos estimados para a população como um todo.

Palavras-chave: avaliação de impacto, programa Bolsa Familia, escolas ensino fundamental

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I. Introduction

Most economists agree that increased levels of education can lead to increased economic growth and higher incomes (Barro, 1991; Mankiw, Romer and Weil, 1992; Hanushek and Kimko, 2000; Krueger and Lindahl, 2001; Sala-i-Martin, 2004; Hanushek and Woessmann, 2008) and, more generally, a higher quality of life. This support for education among economists is matched by even greater enthusiasm among, and financial support from, international development institutions. Indeed, two of the eight Millennium Development Goals (MDGs) adopted at the United Nations Millennium Summit in September 2000 focus on education: first, all children should complete primary school by 2015, and second, gender equality should prevail at all levels of education by 2015.

To achieve the Millennium Goals, parents must first be able to overcome the economic and social barriers to enrolling their children in school. These barriers include not only the direct cost of schooling, such as school fees, books and uniforms, but also the opportunity cost of time in school – the reduction in the amount of time children spend working or doing other activities when they increase the time they spend studying, both in school and at home. Several programs have gone beyond reducing or eliminating fees or providing free textbooks and uniforms: they actually pay the families of students who attend school. These programs are called conditional cash transfer programs. They have two main objectives: (1) alleviate current poverty; and (2) increase investments in human capital so that children in poor families will have a better standard of living when they become adults. The first objective is accomplished when poor families receive money from the program. The second is achieved by conditioning the cash transfers to households on certain behaviors of household members, such as visiting health facilities, immunizing young children, and enrolling older children in school. Those programs have become widespread in developing countries, especially in Latin America. The two largest programs are the *Progressa* (later renamed *Oportunidades*) program in Mexico and the *Bolsa Escola* (later renamed *Bolsa Familia*) program in Brazil.

Latin American countries have made significant progress toward increasing school enrollment and educational attainment in the past 25 years. For example, the primary net enrollment rate increased from 70% in 1980 to 94% in 2004, and the secondary net enrollment rate increased from 16% to 61% over the same period (Damon and Glewwe, 2007). But, there is room for further progress. For example, although enrolment rates in Brazil increased from 86% in 1990 to 97% in 2001 for younger children (8-11 years old), at age 14 this rate in 2001 was 92% and at age 15 only 87%. Thus, in 2001 40% (nine million) of Brazilian youths from 18 to 25 years old had not completed 8 years of education (PNAD, 2001). To encourage all children to complete 8 years of schooling, Brazil's Federal government launched the *Bolsa Escola* conditional cash transfer program in 2001.

The *Bolsa Escola* program, which was renamed *Bolsa Familia* in 2003, provides benefits to poor families with children up to 15 years old, conditional on those children being enrolled in school. Several studies have shown that conditional cash transfer programs increase students' enrolment, decrease child labor, improve the nutritional and health status of young children, and even decrease income inequality. For example, Gertler, Patrinos and Codina (2007) found a positive impact of the *Progressa* program on students' educational outcomes in Mexico. Gertler (2004) also demonstrated that the *Progressa* program improved the health of Mexican children. Turning to Brazil, Barros et al. (2006) estimate that the *Bolsa Familia* program decreased poverty and income inequality in that country, and Ferro, Kassouf and Levison (2007) show that the *Bolsa Familia* program reduced child labor. While many studies have estimated the impact of Mexico's

Progressa program on students' educational outcomes in that country (see the review by Parker, Rubalcava and Teruel, 2008), very few have analyzed the impact of the *Bolsa Escola/Familia* program on students' educational outcomes in Brazil.

This paper focuses on the educational outcomes of primary and lower secondary students in Brazil, the most populous country in Latin America. It uses an unusually rich data set to evaluate the impact of *Bolsa Escola/Familia* program on children's progress in school, as measured by enrollment, grade promotion and dropout rates, using school census data from 1998 to 2005. It does so using panel data: the same school can be followed for eight years using Brazilian school census data. Estimates are presented for schools with grades 1-4 and for schools with grades 5-8.

The remaining sections of the paper provide a short literature review, describe the *Bolsa Escola/Familia* Program and the data, explain the estimation methodology, and present the estimation results. A final section summarizes the findings and provides suggestions for further research.

II. Literature Review

Parker, Rubalcava and Teruel (2008) reviewed a large number of studies that have analyzed the impact of conditional cash transfer programs on schooling in Latin America and other developing countries. Maluccio and Flores (2004) used a difference-in-differences approach to study the *Red de Proteccion Social* program in Nicaragua. They estimate that the program increased enrolment by 17.7 percentage points, raised attendance by 11 percentage points, and improved retention rates by 6.5% for children in grades 1 to 4 in that country. In Honduras, the *Programa de Asignacion Familiar* had a positive impact on both daily attendance and enrolment rates, and a negative effect on dropping out, for children age 6 to 13 (Glewwe and Olinto, 2004). Attanasio, Fitzsimons and Gomez (2005) found that the program *Familias en Accion* in Colombia increased enrolment among children age 12 to 17, but had no effect for children between 8 and 11 years old. Schady and Araujo (2006) obtained a positive impact of the program *Bono de Desarrollo Humano* on children's enrolment in Ecuador. Two programs of interest outside of Latin America are those in Bangladesh and Cambodia, which targeted girls' education. Khandker, Pitt and Fuwa (2003) found a positive impact on the enrolment of 11 to 18 years old girls in Bangladesh, while Filmer and Schady (2006), estimated that the *Japan Fund for Poverty Reduction* program in Cambodia significantly increased enrolment and attendance of girls in secondary school.

Many, if not most, studies have focused on the impact of the *Progresa* program on children's educational outcomes in Mexico. Behrman, Sengupta and Todd (2000) found that *Progresa* Program increased enrolment rates of 12 to 14 year old girls. However, they did not find a significant impact on enrolment rates of individuals younger than 12. They attributed this finding to already high enrolment rates for such individuals in pre-program data. They also found, for children between 11 and 15 years old, a significant reduction in the schooling gap, defined as the difference between the grade an individual would have completed if he or she entered school at age six and progressed one grade each year, and the grade actually attained. Schultz (2004) found a strong positive effect of the *Progresa* program on girls' and boys' school enrolment, with a stronger effect for girls. Dubois, de Janvry and Sadoulet (2004) found that *Progresa* Program had a positive impact on the probability that children remain in school, and on grade progression and success at the primary level. However, for the secondary level the impact on grade progression was negative. Lastly, Skoufias and Parker (2001) also found that the *Progresa* program

significantly increased school enrolment and reduced participation in work activities of boys and girls in Mexico.

In contrast to the extensive research on Mexico's *Progresa* program, only a few studies have evaluated the impact of *Bolsa Escola/Familia* on school enrollment, perhaps because the randomized implementation of the *Progresa* program greatly reduced difficulties in estimating program effects. The first evaluation, done by the World Bank (2001), focused on the *Bolsa* program in the Federal District (which is Brazil's capital, Brasilia) in 1995 and 1996. This study, which consisted of simple comparisons of beneficiaries and non-beneficiaries, suggests that the *Bolsa* program reduced dropout rates by about 6 percentage points, increased grade promotion rates by 8-10 percentage points, but had little effect on Portuguese, math and science test scores. Yet this early study has several shortcomings. First, and most important, it did not account for initial differences between beneficiaries and non-beneficiaries. Second, it was conducted in the capital city, a relatively wealthy area that is not representative of the entire country. Finally, the program has changed in many ways since 1995 and 1996, as explained below.

Bourguignon, Ferreira and Leite (2003) analyze Brazilian household survey data collected in 1999 to estimate a model of household behavior that is then used to simulate the (future) impact of the *Bolsa Escola* program. They estimate that the program will induce more than half of eligible youths who are currently not in school to enroll. Yet the authors caution that the results heavily depend on technical assumptions and thus they attempt only "to obtain orders of magnitude for the likely effects of transfer programs of the *Bolsa Escola* type." While this paper is an interesting economic exercise, it is not intended to precisely estimate the impact of the *Bolsa Escola/Familia* program. Some assumptions needed to provide identification for the model, such as the assumption that children who work outside the home and are not in school do not work in the household (p.237), are doubtful. Overall, this paper provides little guidance as to the impact of the program.

Two studies by Brazilian researchers are Cardoso and Souza (2003), and Ferro and Kassouf (2005). They both estimate that the *Bolsa Escola/Familia* program has a large positive impact on school enrollment. However, these studies used cross-sectional data and did little to control for selection into the program and, more generally, omitted variable bias. Moreover, these evaluations used data from 2000 (the Demographic Census) and 2001 (PNAD, the National Household Sample Survey). Since the program became widespread nationally in the same year, 2001, there is a need for new research to analyze the impact of the program after several years have passed.

A much more recent and thorough study is that of de Janvry, Finan and Sadoulet (2007). They find that the *Bolsa Escola/Familia* program reduced dropout rates by about 8 percentage points but had little effect on repetition rates. Yet this analysis is limited to the Northeast region of Brazil and has a much smaller sample of schools compared to the census data used in this paper, which reduces the precision of the estimated effects. Some key variables are also missing from their data, such as the race of the students; it will be seen below that the impact of the program varies by race.

In summary, despite the fact that the *Bolsa Escola/Familia* program is the largest conditional cash transfer program in the world, very little research has been done on it, and the research to date suffers from estimation problems, data that cover only part of the country, and (in most cases) analysis of the program in its very early stages. The analysis presented here is based on data from all regions of Brazil, and uses data over eight years, including five years when the

program was operating on a national scale. Finally, it develops an estimate procedure designed to minimize selection bias and other estimation problems.

III. Description of *Bolsa Escola/Familia* Program

Brazil's *Bolsa Escola* program began operating in 1995. Initially, it was not implemented at the national level; instead it was first implemented by a small number of *municipios* (equivalent to U.S. counties). The first two *municipios* to implement the *Bolsa Escola* program were the cities of Brasilia (also called the Federal District) and Campinas (located in São Paulo State). The program provided stipends (cash payments) to poor families with children from 6 to 15 years old conditional on their children being enrolled in school and attending at least 85% of school days. By 1998 more than 50 *municipios* in seven states of Brazil (out of 26 plus the Federal District) had adopted a similar program. Yet this still accounts for only 1% of Brazil's over 5000 *municipios*.

Given the program's popularity and the positive results that started to appear from studies evaluating similar programs in other Latin American countries as well as in Brazil, the federal government, under President Fernando Henrique Cardoso, decided in April 2001 to create the Federal *Bolsa Escola* Program. According to the Social and Development Ministry, by the end of 2001, almost 5 million families were receiving the stipend in more than 5,000 *municipios* (out of 5,560). In 2003, under President Luis Inacio Lula da Silva, *Bolsa Escola* became *Bolsa Familia*, and the program's benefits were expanded. While *Bolsa Escola* included only poor families with children from 6 to 15 years old,[1] *Bolsa Familia* included all families with monthly per capita incomes below 60.00 Reals (30.00 dollars) and families with monthly per capita incomes between 60.00 and 120.00 Reals that had children from 0 to 15 years old or a pregnant or breastfeeding woman. By 2007, more than 11 million families, or about 46 million people (about one fourth of Brazil's population) were beneficiaries of the program. The government budget for *Bolsa Familia* has reached more than 7.5 billion Reals (about 4 billion U.S. dollars) in 2006, representing 0.5% of GNP.

To be eligible for the *Bolsa Familia* program, families must have a monthly per capita income below 120.00 Reals, that is below one-half of Brazil's minimum wage, and must have either children younger than 16 years old or a breastfeeding or pregnant woman. Families with income below 60.00 Reals per capita per month are considered to be in extreme poverty and receive the cash transfer even in the absence of children or a pregnant or breastfeeding woman. The monthly stipend paid to families varies from 15 Reals (approximately US$ 7) to 95 Reals (approximately US$ 47), depending on family income and the number of children. Families with a per capita income between 60 and 120 Reals per month, receive 15 Reals per beneficiary (either a child below age 16 or a pregnant or breastfeeding woman) up to a maximum of three beneficiaries per family (to avoid incentives to increase fertility). Families in extreme poverty (per capita income below 60 Reals per month) receive 50 Reals per month plus an additional 15 Reals per beneficiary, up to a maximum of three beneficiairies per family.

Conditional cash transfer programs are often preferred to standard income transfer programs because of the conditionalities they impose on families. For example, the *Bolsa Familia* program requires that each child between ages 6 and 15 be enrolled in school and attend at least 85% of school days, that pregnant women obtain prenatal and post natal health care services and that children between 0 and 7 years old have all the recommended vaccinations. The increase in human capital that should result from increased education and better health status is intended to

[1] This program was expanded in March 2008 to include 16 and 17 year old youths.

allow families to break out of their cycle of poverty, improve their quality of life and end their dependence on public assistance programs.

To enroll in the *Bolsa Familia* program, poor families must fill out an application, which is available at the city hall of their *municipio*. The information provided on the application is used to select the families, taking into account the available budget and the estimated number of poor families in each *municipio*. These estimates are performed by members of the Ministry of *Casa Civil* and researchers from Geographical and Statistical Brazilian Institute (IBGE), Brazil's national statistics agency, and the Applied Economics Research Institute (IPEA), a government economic research center. The numbers are based on the latest demographic census and recent household surveys (PNAD).

IV. Data Available

This study uses school census data from 1998 to 2005 to create a panel of schools. Table 1 shows the number of schools in each census. The focus is on children from 1st to 8th grade, which includes the age range eligible to receive benefits from the *Bolsa Escola/Familia* program. Schools may have 1st to 4th grade classes or 5th to 8th grade classes, or both, besides having preschool and/or higher levels, such as high school, adult education, and vocational classes. The number of schools having 1st to 4th or 5th to 8th grade classes (or both) is presented in the third column of Table 1. Over time there is a steady decrease in the number of schools with 1st to 4th and/or 5th to 8th grades. The reasons for this decline include demographic trends in Brazil (reduced fertility), a policy of merging small schools into larger ones, and a policy of closing some schools in bad physical condition. Although the number of schools having 1st to 4th or 5th to 8th grade classes or both have declined since 1998, the number of preschools and high schools increased by more than 40% from 1998 to 2005.

The fourth column in Table 1 shows how a panel data set was constructed for schools having 1st to 4th grade and/or 5th to 8th grade classes by merging the school census data over time, starting in 1998 and ending in 2005. In 1998, there were 187,514 schools with 1st to 4th grade and/or 5th to 8th grade classes. Of these, 174,153 could be matched (using school ID codes) with the 183,475 schools in 1999 census (a match rate of 95%). Each additional row in Table 1 shows how the panel set slowly becomes smaller as each additional year is merged in. Finally, in 2005 there are 136,114 schools, of which 107,243 have data for all years from 1998 to 2005.

The last 2 columns in table 1 show the percentage of schools participating in *Bolsa Escola/Familia* program in each year (more precisely, schools that report that one or more students participate in *Bolsa Escola/Familia*), starting from 2001 for 1st to 4th and 5th to 8th grade schools, respectively. In 2001, only 23.5% of the 1-4 grade schools participated in the *Bolsa Escola/Familia* program. This number increased sharply in 2002 to 84.7%, but after that participation gradually increased each year, reaching 90.8% in 2005. Similarly, in 2001 only 13.3% of the 5-8 grade schools had Bolsa and in 2005 this percentage increases to 86.4.

V. Methodology

Let y_{st} be an educational outcome of interest, such as the enrollment rate, the grade promotion rate or the dropout rate, for school s at time t for a particular set of grades (e.g. grades 1-4 or grades 5-8). In general, y_{st} is a function of child and household characteristics (denoted by the vector $\mathbf{c}_{ist}$), school and teacher characteristics ($\mathbf{s}_{st}$), and whether the *Bolsa* program operates at that time in the *municipio* in which that school is located (B_{st}, which in our data is measured by

whether the school reports one or more students participating in that program).[2] For simplicity, assume that this relationship is linear (a more general functional form, with interaction effects, is presented below):

$$y_{st} = \boldsymbol{\alpha}'\mathbf{c}_{st} + \boldsymbol{\beta}'\mathbf{s}_{st} + \gamma B_{st} + \varepsilon_{st} \qquad (1)$$

where ε_{st} is a random error term that reflects idiosyncratic determinants of, and perhaps random measurement error in, y_{st}.

If data were available for all the variables in $\mathbf{c}_{st}$ and $\mathbf{s}_{st}$, and for the operation of the *Bolsa* program (B_{st}), one could estimate equation (2) by OLS and obtain consistent estimates of γ, the average impact of the availability of the *Bolsa* program on y_{st}. Unfortunately, many of the variables in $\mathbf{c}_{st}$ and $\mathbf{s}_{st}$ are not observed, and some may be almost impossible to measure. For example, $\mathbf{c}_{st}$ (child and household characteristics) could include child innate ability and parental tastes for schooling, and $\mathbf{s}_{st}$ (school and teacher characteristics) could include principal and teacher motivation and a wide variety of hard to measure school characteristics. Estimation of equation (1) using only observed variables in $\mathbf{c}_{st}$ and $\mathbf{s}_{it}$ effectively relegates all of the unobserved variables to the error term, ε_{st}, which is likely to cause this new error term to be correlated with the observed variables in $\mathbf{c}_{st}$ and $\mathbf{s}_{st}$ and with B_{st} and thus will lead to biased estimates of γ.

One approach to overcome this bias is to find instrumental variables for the observed variables in $\mathbf{c}_{st}$ and $\mathbf{s}_{st}$ and for B_{st}, but no plausible instruments are available in our data. Instead, we argue that the unobserved variables (and the observed variables as well) in $\mathbf{c}_{st}$ and $\mathbf{s}_{st}$ change slowly over time and thus they can be approximated by school and time fixed effects, plus state-specific time trends (Brazil is composed of 26 states plus the Federal District). This can be expressed as:

$$\boldsymbol{\alpha}'\mathbf{c}_{st} + \boldsymbol{\beta}'\mathbf{s}_{st} \approx \sigma_s + \tau_t + \pi_{01,j} \times D_{01,j} \times t + \pi_{02,j} \times D_{02,j} \times t \qquad (2)$$

where σ_s is a (time invariant) school fixed effect, τ_t is a (school invariant) year fixed effect, $D_{01,j}$ is a dummy variable indicating a school in state j that adopted the *Bolsa* program in 2001, $D_{02,j}$ is a dummy variable indicating a school in state j that adopted the *Bolsa* program in 2002 or a later year, and t is a yearly time trend. Note that time trends are allowed to vary across states and to be different for schools where *Bolsa* started in 2001 (about 23% of the schools) and schools where *Bolsa* was implemented in a later year (the rest of the schools, including the 2% where had not started by 2005).

Inserting (2) into (1) yields the simplest equation for estimating the impact of the *Bolsa* program on education outcomes:

$$y_{st} \approx \sigma_s + \tau_t + \pi_{01,j} \times D_{01,j} \times t + \pi_{02,j} \times D_{02,j} \times t + \gamma B_{st} + \varepsilon_{st} \qquad (3)$$

In fact, it is not necessary to substitute observed variables in $\mathbf{c}_{st}$ and $\mathbf{s}_{it}$ out of equation (1). If the assumptions behind this estimation method are correct, adding those observed variables will

[2] Community characteristics, such as child wage rates, job prospects for educated adults, and local preferences for education, could be added to equation (1). That is not done here to avoid notational clutter, and because the data available from Brazil include no community characteristics. However, it is not difficult to include those variables; they could be specified in the same way that the school variables ($\mathbf{s}_{st}$) are specificed.

not change the estimated value of γ (the impact of the *Bolsa* program) and may even lead to more precise estimates of that parameter. That is, one could estimate the following:

$$y_{st} \approx \boldsymbol{\alpha}'\mathbf{c}_{st} + \boldsymbol{\beta}'\mathbf{s}_{st} + \sigma_s + \tau_t + \pi_{01,j} \times D_{01,j} \times t + \pi_{02,j} \times D_{02,j} \times t + \gamma B_{st} + \varepsilon_{st} \qquad (4)$$

where $\mathbf{c}_{st}$ and $\mathbf{s}_{it}$ are redefined to be only the *observed* child and school variables, respectively, and the expression $\sigma_s + \tau_t + \pi_{01,j} \times D_{01,j} \times t + \pi_{02,j} \times D_{02,j} \times t$ now controls for only *unobserved* school and child variables.

An implicit assumption thus far is that the impact of the *Bolsa* program is the same for all children and all schools. In fact, it is likely to vary across both children and schools. Since only poor children are eligible for the program, then the impact should be strongest for those children and negligible for non-eligible children. Turning to school variables, the program may have the largest effects in schools with meager facilities, or instead it may work best in schools that already have high quality facilities. To examine whether the impact of the program varies by child and school characteristics, interaction terms between observed child and school variables and the *Bolsa* program variable can be added to equation (4):

$$y_{st} \approx \boldsymbol{\alpha}'\mathbf{c}_{st} + \boldsymbol{\beta}'\mathbf{s}_{st} + \sigma_s + \tau_t + \pi_{01,j} \times D_{01,j} \times t + \pi_{02,j} \times D_{02,j} \times t + \gamma B_{st} + \boldsymbol{\delta}'(\mathbf{c}_{st} \times B_{st}) + \boldsymbol{\theta}'(\mathbf{s}_{st} \times B_{st}) + \varepsilon_{st} \qquad (5)$$

To ease the interpretation of the coefficient estimates, $\mathbf{c}_{st}$ and $\mathbf{s}_{st}$ can be rescaled to have a mean of zero (that is, they are deviations from their mean values) so that γ is an estimate of the impact of the *Bolsa* program on a school with average child and school characteristics (for such a school the rescaled $\mathbf{c}_{st}$ and $\mathbf{s}_{it}$ variables all equal zero).

Another implicit assumption of the methodology is that the full impact of the *Bolsa* program occurs in the first year that it is adopted, and is the same in subsequent years. Yet it may be more realistic to allow impacts to accumulate over time since children remain in the same school for several years and their cognitive skills are stocks that increase over time. To estimate cumulative effects, one can add lagged program variables. For example, equation (4) can be modified by including several lags:

$$y_{st} \approx \boldsymbol{\alpha}'\mathbf{c}_{st} + \boldsymbol{\beta}'\mathbf{s}_{st} + \sigma_s + \tau_t + \pi_{01,j} \times D_{01,j} \times t + \pi_{02,j} \times D_{02,j} \times t + \gamma_0 B_{st} + \gamma_1 B_{s,t-1} + \gamma_2 B_{s,t-2} + \varepsilon_{st} \qquad (6)$$

In this equation γ_0 estimates the immediate impact of the program, the sum of γ_0 and γ_1 estimate the cumulative impact after two years, and $\gamma_0 + \gamma_1 + \gamma_2$ estimates the cumulative impact after three years.

VI. Results

This section presents the regression results, using the methodology presented in Section V. The first subsection presents the school level regressions for grades 1-4, while the second presents the results for grades 5-8.

A. Grades 1-4. Table 2 presents the first set of estimates of the impact of the *Bolsa* program on (log) enrollment, dropping out and grade promotion for children in grades 1-4. The top panel shows estimates for equation (3), the simplest econometric specification; in each regression the dependent variable is regressed on a dummy variable indicating that one or more

students participated in the *Bolsa* program at a given school in a given year. Recall that, to control for unobserved heterogeneity that may be correlated with the *Bolsa* variable, this regression (and all the other regressions presented in this paper) adds year fixed effects, school fixed effects, state-level time trends in schools that adopted *Bolsa* in 2001, and analogous trends for schools that adopted Bolsa in 2002 or later. Additional time trends, based on enrollment in 1998, are added to account for the government's policy of merging small schools into larger schools throughout this time period. The impact of the *Bolsa* variable on all three education outcomes is highly significant and has the expected sign. More specifically, the presence of the *Bolsa* program increases enrollment by 2.8%, reduces the dropout rate by 0.31 percentage points, and increases the grade promotion rate by 0.53 percentage points. Since only about 43% of the students are eligible for the program, adding the plausible assumption that the program had very little effect on ineligible students implies that the program raised enrollment by 6.5% for eligible students, reduced the dropout rate for those students by about a 0.7 percentage point and increase the grade promotion rate for those students by about 1.2 percentage points. For reference, note that the net primary school enrollment rate in Brazil was about 95% around this time, while the primary repetition rate was 11% and the grade promotion rate was 71%.

Of course, it is possible that the control variables used in the regression in the top panel of Table 2 do not completely remove confounding factors that are correlated with the *Bolsa* program. Intuitively, there may be other, unobserved changes that occurred in schools around the time that their students started to participate in the *Bolsa* program that affect these three dependent variables and are not adequately captured by these control variables, which would lead to biased estimates in that regression. To check this possibility, we examine only the first three years of data, from 1998 to 2000. Suppose there is an unobserved dummy variable that has a direct causal impact on these education variables and is highly correlated with the timing of the adoption of the *Bolsa* program; in some schools that adopted *Bolsa* in 2001 this variable would switch from zero to one in 2000.[3] This implies that, using only the first three years of data, regressing these three dependent variables on a "fake" variable that equals zero for all schools in 1998 and 1999 but equals one in 2000 for the schools that adopted *Bolsa* in 2001 would lead to a significant impact of that variable on the dependent variables. Such a regression is presented in the second panel of Table 2. All of the coefficients are much smaller (an order of magnitude smaller for the enrollment and dropout regressions) than the *Bolsa* coefficients in the first panel, and all are statistically insignificant. This suggests that it is the *Bolsa* program itself, and not some unobserved school or community variables that are correlated with *Bolsa*, that causes the changes in school enrollment, dropping out and grade promotion seen in the top panel of Table 2.

The last panel in Table 2 estimates equation (4) by adding a wide variety of school variables, plus a variable indicating the percentage of students who are girls, to the regression. Again, it is possible that changes in school facilities or school programs that are correlated with the *Bolsa* program are the real underlying causes of changes in enrollment, dropping out and grade promotion. Yet table 2 shows that adding these variables has no effect on the estimated impact of the *Bolsa* program.

Technically speaking, the estimates of the impact of the *Bolsa* program in Table 2 are estimates of the impact of the availability of the program on the average student. Yet it is very likely that the impact will vary over different types of students and schools. First, only students

[3] For example, for the schools that adopted *Bolsa* in 2001 the associated variable switches from 0 to 1 in that year, while a variable that is highly correlated with the *Bolsa* dummy variable may switch from 0 to 1 in 2001 for about 40% of those schools, and switch from 0 to 1 in 2000 in about 30% of those schools and in 2002 in the other 30%.

from poor families are eligible for the program. Second, among poor students the impact may vary because those students' probabilities of enrolling, dropping out and being promoted vary; for example, Table 2 indicates that girls are more likely to be enrolled, less likely to drop out and more likely to be promoted to the next grade, which suggests that the program has less scope for improving girls' education outcomes, relative to those of boys. Third, the impact of the program may vary according to the quality of the school, as indicated by the presence of various facilities and programs. The sign of this effect is ambiguous, as it depends on whether the *Bolsa* program is a substitute or a compliment to these other school characteristics in terms of their impacts on the three dependent variables.

Table 3 investigates differences in the impact of the *Bolsa* program over different types of schools and different types of students by estimating equation (5), that is by adding interaction terms between the program variable and those variables. Turning to the interactions with school characteristics, the positive average impact of the *Bolsa* program on enrollment is higher for schools with more computers and computer labs, libraries, and better educated teachers. All of these (differential) effects are significant at the 1% level. However, the impact is lower for schools that participate in the school computer program, although this differential is statistically significant only at the 5% level.

Differential effects by schools characteristics are less likely to be statistically significant in the drop out and grade promotion regressions. For dropping out, it seems that all of the effect is for schools without libraries, since the interaction term between the program and that variable is negative and very similar in size (-0.357) to the average impact of the *Bolsa* variable (0.324). Similarly, the impact of the program on dropping out also seems to be nullified by the existence of the computer program. Finally, the positive impact of the program on grade promotion is amplified in schools that have computer labs but nullified in schools that have libraries, the school TV program and the school computer program. Overall, it is difficult to say why the *Bolsa* program has stronger or weaker impacts in some types of schools than in others, and until further research is done one should probably not draw any policy conclusions from these results.

Turning to the interactions with student characteristics, only three types of characteristics are considered because the school census data have only three such variables: sex and race and age of students entering grade 1. The first two were used to generate school level variables indicating the proportion of students who were girls, black, mulatto, East Asian ("yellow") and indigenous; white is the omitted category for the race variable. The race variable is available only for 2005, yet the racial composition of schools is likely to change only very slowly over time. Since the race data exist only for a single year, and the specification includes school fixed effects, race variables cannot be used as regressors, but they can be interacted with the presence of the *Bolsa* program.

The third child variable, age when entering grade 1, was constructed by calculating the age of children currently in grade one and then subtracting the repetition rate for that grade. Since grade promotion is one of our dependent variables, this variable must be "purged" of any effect of its opposite, repetition, on the average age of children in grade 1. This variable is intended to measure households' socio-economic status (which is not otherwise measured in the data); households with limited resources, and/or parents with lower tastes for education, are likely to enroll their children in school at a later age.

In general, girls outperform boys in terms of enrollment, dropping out and grade promotion, so one may expect the *Bolsa* program to have smaller impacts for girls since all of these variables have upper limits. Regarding race, black, mulatto and indigenous children

generally have lower educational outcomes than do white and Asian children, so there is more scope for the program to increase their enrollment and grade promotion rates and reduce their dropout rates. Finally, children who start school at a late age tend to come from poorer, disadvantaged backgrounds, and there is also more potential for *Bolsa* to have an impact on them relative to children who start school at the usual time.

The results in Table 3 show that the positive impact of the *Bolsa* program on enrollment is stronger for girls than for boys, and the negative impact on the *Bolsa* program on dropping out is stronger for girls than for boys. In contrast, the positive impact on grade promotion is somewhat smaller for girls than for boys. Thus the program is particularly effective at helping girls enroll in, and stay in, school but is somewhat less effective at improving there academic performance (as measured by grade promotion rates).

Turning to differential impacts by race, as expected, the *Bolsa* program is more effective at increasing the enrollment rates of blacks, mulattos and indigenous children than it is for white children, which suggests that it equalizes enrollment rates by race. Somewhat surprisingly, it also increases enrollment rates of Asian students, again relative to whites, despite the fact that Asians' enrollment rates are not lower than those of whites. Turning to dropping out rates, there is little difference by race, except that the negative impact of the *Bolsa* program is weaker for blacks. This may reflect the fact that increasing enrollment for relatively weak students may, in later years, lead to increased dropping out for those schools. Finally, the positive impact of the program on grade promotion is somewhat smaller for blacks, indigenous students, and Asians, although the impact for blacks is significant only at the 10% level. One possible explanation for these negative effects is that the increase in enrollment rates for all of these groups brought in relative weak students, who are more likely to repeat a grade.

The specifications in Tables 2 and 3 are relatively simplistic in that they assume that the program has an impact that does not depend on how many years the program is in place. Yet impacts may accumulate over time as students receive the "treatment" for longer periods of time. Table 4 estimates equation (6), that is it examines the extent of such cumulative effects by adding lag variables for the *Bolsa* variable that go back three years. For all three dependent variables, the impacts accumulate over time, but peak after two or three years. More specifically, the impact on the enrollment rate is a 2.8% increase after one year, a 4.3% increase after two years, and a 5.5% increase after three years. Assuming that all of this effect is concentrated on the eligible population (i.e. the poor population), which constitute about 43% of the total population of school age children, these results indicate that the long-run impact of the program on enrollment rates is to raise them about 13% among the eligible population.

Similarly, the impact of the *Bolsa* program on dropout rates and grade promotion rates also accumulates over time, although the full effect is felt after two years. The estimates indicate that the program reduces the dropout rate by 0.3 percentage points after one year and by about 0.45 percentage points after two years. Assuming again that all of this impact is concentrated on the eligible population implies that the program reduces the dropout rate for the average person in the eligible population by about 1.0 percentage point. Turning to estimates of the program's impact on grade promotion rates, they indicate that the program raises that rate by about 0.5 percentage points after one year and by nearly 1.0 percentage points after two years, which implies that the long-run impact of the program is to raise grade promotion rates by about 2.3 percentage points for the eligible population.

B. Grades 5-8. Table 5 repeats the analysis in Table 2 for children in grades 5-8. The sample size is only about as third as large, since there are fewer schools at higher levels of

education, but the sample is still unusually large at around 182,000 observations (nearly 23,000 schools over eight years).

Beginning with the simplest specification in the top panel of Table 5, the *Bolsa* program appears to increase enrollment by about 3.2 percentage points, which (assuming that all of this impact is concentrated on the 43% of the population of school age children that is eligible for the program) implies an increase in enrollment of about 7.4 percentage points for the eligible population. The estimates also indicate that the program reduces dropout rates, and raises grade promotion rates, by about 0.3 percentage points for the population as a whole, and by about 0.7% of the eligible population. These estimates are strikingly similar to those in Table 2, with the exception that the impact on grade promotion rates is only about half as large. This probably reflects the fact that repetition rates in grades 5-8 are lower than those in grade 1-4.

The second and third panels in Table 5 check the robustness of the results in the first panel. As in Table 2, the second panel generates a "fake" *Bolsa* variable to check whether the impacts seen in the first panel are in fact due to something else. Again, there is no evidence of that the first panel regressions are biased. Similarly, the third panel adds a variety of school variables to see whether changes in those variables may be leading to biased estimates of the impact of the *Bolsa* program. Again, the estimated impacts of the program are unaffected by the addition of these variables.

VII. Conclusion

This paper focuses on the educational outcomes of primary and lower secondary students in Brazil. It uses an unusually rich data set to evaluate the impact of *Bolsa Escola/Familia* program on children's progress in school, as measured by enrollment, grade promotion and dropout rates, using school census data from 1998 to 2005. It does so using panel data: the same school can be followed for eight years using Brazilian school census data. By 2007, more than 11 million families, or about 46 million people (about one fourth of Brazil's population) were beneficiaries of the *Bolsa* program, considered the largest in the world.

To obtain the impact of the *Bolsa* program on (log) enrollment, dropping out and grade promotion of children in grades 1-4 and 5-8, we estimate regressions that control for year fixed effects, school fixed effects, state-level time trends in schools that adopted *Bolsa* in 2001, and analogous trends for schools that adopted Bolsa in 2002 or later, and time trends based on enrollment in 1998 (to reflect the trend to merging small schools). Moreover, the impacts may accumulate over time as students receive the "treatment" for longer periods of time. So, we create lag variables for the *Bolsa* variable that go back three years. For all three dependent variables, the impacts accumulate over time, but peak after two or three years. More specifically, the impact on the enrollment rate is a 2.8% increase after one year, a 4.3% increase after two years, and a 5.5% increase after three years. Assuming that all of this effect is concentrated on the eligible population (i.e. the poor population), which constitute about 43% of the total population of school age children, these results indicate that the long-run impact of the program on enrollment rates is to raise them about 13% among the eligible population. Similarly, the impact of the *Bolsa* program on dropout rates and grade promotion rates also accumulates over time, although the full effect is felt after two years. The estimates indicate that the program reduces the dropout rate by 0.3 percentage points after one year and by about 0.45 percentage points after two years. Assuming again that all of this impact is concentrated on the eligible population implies that the program reduces the dropout rate for the average person in the eligible population by about 1.0 percentage point. Turning to estimates of the program's impact on grade promotion rates, they indicate that

the program raises that rate by about 0.5 percentage points after one year and by nearly 1.0 percentage points after two years, which implies that the long-run impact of the program is to raise grade promotion rates by about 2.3 percentage points for the eligible population.

Similar results are found for children in grades 5-8. *Bolsa* program appears to increase enrollment by about 3.2 percentage points, which (assuming that all of this impact is concentrated on 43% of the population that is eligible for the program) implies an increase in enrollment of about 7.4 percentage points for the eligible population. The estimates also indicate that the program reduces dropout rates, and raises grade promotion rates, by about 0.3 percentage points for the population as a whole, and by about 0.7% of the eligible population.

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Table 1 – Data information on school census from 1998 to 2005.

School census years (1)	Total number of schools (2)	Schools with 1st to 4th and/or 5th to 8th grade classes (3)	School with panel data from 1998 to current year (4)	% of schools with Bolsa Escola/familia program 1st to 4th grade	% of schools with Bolsa Escola/familia program 5th to 8th grade
1998	267,532	187,514	187,514	-	-
1999	266,645	183,475	174,153	-	-
2000	261,988	181,532	166,251	-	-
2001	264,735	177,808	157,081	23.5	13.3
2002	256,986	172,529	148,209	84.7	76.0
2003	253,405	169,096	141,716	88.3	83.2
2004	248,257	143,262	116,285	90.3	85.8
2005	248,103	136,114	107,243	90.8	86.4

Source: school census.

Table 2 – Program Impact on Enrollment, Dropping out and Promotion: Basic Results (public schools with grades 1 to 4)

	Log enrollment		Dropping out		Promotion	
Variables	Coef.	S. E.	Coef.	S. E.	Coef.	S. E.
Basic Model (1998-2005)						
School with *Bolsa Escola/Familia*	.0282***	.0018	-.309 ***	.0582	.533 ***	.0779
Number of observations	699,255		698,229		698,229	
F – test	375.6 ***		350.5 ***		182.3 ***	
Basic Model (1998-2000 only)						
School with *Bolsa Escola/Familia* in 2001, assigned to year 2000	.00136	.0028	-.031	.136	.265	.168
Number of observations	262,220		261,845		261,845	
F – test	71.9 ***		22.3 ***		32.8 ***	
Adding School/Child Variables (1998-2005)						
School with *Bolsa Escola/Familia*	.0274 ***	.0018	-.310 ***	.058	.530 ***	.0780
Computer lab	.0353 ***	.0033	-.094 *	.056	.604 ***	.0776
Computer	.0491 ***	.0031	-.017	.060	.269 ***	.0799
Library	.0203 ***	.0027	.090 *	.053	-.102	.0707
Teacher college	.0001 ***	.0000	-.002 ***	.001	.0002	.0010
Program meal	.0125 ***	.0032	-.316 ***	.108	.208	.1365
Program school TV	.0042 **	.0017	-.008 ***	.044	-.121 **	.0569
Program computer	-.0136 ***	.0021	.174	.045	-.403 ***	.0698
Girl	.0014 ***	.0001	-.013 ***	.002	.031 ***	.0031
Number of observations	699,255		698,229		698,229	
F – test	353.8 ***		314.1 ***		165.3 ***	
Control variables (all regressions)						
Dummies for years 98 – 05	yes		yes		yes	
Trend x enrollment level in 98 (08)	yes		yes		yes	
Trend x states x Bolsa in 2001 (27)	yes		yes		yes	
Trend x states x Bolsa in 2002+ (27)	yes		yes		yes	
Dummies for Schools (87,407)	yes		yes		yes	

Robust standard-errors.
*** significant at 1% level.
** significant at 5% level.
* significant at 10% level.

Table 3 - Program Impact on Enrollment, Dropping out and Promotion: Adding Interaction Terms (public schools with grades 1 to 4, 1998-2005)

	Log enrollment		Dropping out		Promotion	
Variables	Coef.	S. E.	Coef.	S. E.	Coef.	S. E.
School with *Bolsa* Program	0.0231 ***	0.0019	-0.324 ***	0.067	0.490 ***	0.089
Computer lab	0.0216 ***	0.0046	-0.070	0.110	0.287 *	0.150
Computer	0.0385 ***	0.0039	0.011	0.091	0.227 *	0.120
Library	0.0104 ***	0.0033	-0.099	0.077	0.247 **	0.100
Teacher college	-0.0001 **	0.0000	-0.003 ***	0.001	0.005 ***	0.002
Program meal	0.0095 ***	0.0034	-0.179	0.118	0.096	0.151
Program school TV	0.0037	0.0023	-0.058	0.066	0.054	0.084
Program computer	-0.0041	0.0026	-0.019	0.071	-0.218 **	0.108
Computer lab x *Bolsa* Program	0.0155 ***	0.0050	-0.084	0.116	0.612 ***	0.163
Computer x *Bolsa* Program	0.0502 ***	0.0045	-0.138	0.107	0.040	0.145
Library x *Bolsa* Program	0.0243 ***	0.0038	0.357 ***	0.084	-0.749 ***	0.113
Teacher college x *Bolsa* Prog	0.0004 ***	0.0001	0.001	0.001	-0.006	0.002
Prog school TV x *Bolsa* Prog	0.0002	0.0030	0.132 *	0.080	-0.400 ***	0.105
Prog computer x *Bolsa* Prog	-0.0084 **	0.0036	0.410 ***	0.089	-0.541 ***	0.142
Girl	0.0004 ***	0.0001	-0.021 ***	0.004	0.038 ***	0.005
Girl x *Bolsa Escola/Familia*	0.0021 ***	0.0002	0.017 ***	0.004	-0.011 ***	0.006
Age-repetition 98 x *Bolsa*	-0.0060 ***	0.0012	-0.495 ***	0.033	-0.191 ***	0.043
Black 05 x *Bolsa Escola/Fam.*	0.0010 ***	0.0001	0.009 ***	0.003	-0.016 *	0.004
Mulato 05 x *Bolsa Escola/Fam.*	0.0003 ***	0.0001	-0.002	0.001	0.000	0.002
Indigenous 05 x *Bolsa Escola*	0.0015 ***	0.0001	0.007	0.005	-0.026 ***	0.007
Yellow 05 x *Bolsa Escola/Fam.*	0.0011 ***	0.0002	0.010 *	0.006	-0.025 ***	0.008
(Enrollment 98/1000) x *Bolsa*	-0.156 ***	0.0086	-1.524 ***	0.213	0.940 ***	0.269
Number of observations	562,408		561,789		561,789	
F – test	238.3 ***		228.2 ***		111.7 ***	
Control variables:						
Dummies for years 98 – 05	yes		Yes		yes	
Trend x enrollment in 98 (08)	yes		Yes		yes	
Trend x states x Bolsa in 2001 (27)	yes		Yes		yes	
Trend x states x Bolsa in 2002+ (27)	yes		Yes		yes	
Dummies for Schools (87,407)	yes		Yes		yes	

Robust standard-errors.
*** significant at 1% level.
** significant at 5% level.
* significant at 10% level.

Table 4 - Program Impact on Enrollment, Dropping out and Promotion: Adding Program Lag Terms (public schools with grades 1 to 4, 1998-2005)

	Log enrollment		Dropping out		Promotion	
Variables	Coef.	S. E.	Coef.	S. E.	Coef.	S. E.
School with *Bolsa* Program	0.0276 ***	0.0018	-0.299 ***	0.059	0.508 ***	0.079
School with *Bolsa* lagged 1 year	0.0153 ***	0.0019	-0.245 ***	0.059	0.440 ***	0.082
School with *Bolsa* lagged 2 year	0.0124 ***	0.0022	-0.023	0.065	0.162 *	0.090
School with *Bolsa* lagged 3 year	0.00115	0.0024	0.046	0.077	-0.196 *	0.105
Computer lab	0.0348 ***	0.0033	-0.086	0.056	0.586 ***	0.078
Computer	0.0488 ***	0.0031	-0.015	0.060	0.266 ***	0.080
Library	0.0202 ***	0.0026	0.091 *	0.053	-0.104	0.071
Teacher college	0.00014 ***	0.00003	-0.002 ***	0.001	0.000	0.001
Program meal	0.0128 ***	0.0032	-0.321 ***	0.108	0.216	0.136
Program school TV	0.0041 **	0.0017	-0.007	0.044	-0.125 **	0.057
Program computer	-0.0131 ***	0.0021	0.168 ***	0.045	-0.390 ***	0.070
Girl	0.0014 ***	0.00009	-0.013 ***	0.002	0.031 ***	0.003
Number of observations	699,255		698,229		698,229	
F – test	340.4 ***		302.2 ***		159.1 ***	
Control variables:						
Trend x enrollment in 98 (08)	yes		yes		yes	
Dummies for years 98 – 05	yes		yes		yes	
Trend x states x Bolsa in 2001 (27)	yes		yes		yes	
Trend x states x Bolsa in 2002+ (27)	yes		yes		yes	
Dummies for Schools (87,407)	yes		yes		yes	

Robust standard-errors.
*** significant at 1% level.
** significant at 5% level.
* significant at 10% level.

Table 5 – Program Impact on Enrollment, Dropping out and Promotion: Basic Results (public schools with grades 5 to 8)

	Log enrollment		Dropping out		Promotion	
Variables	Coef.	S. E.	Coef.	S. E.	Coef.	S. E.
Basic Model (1998-2005)						
School with *Bolsa Escola/Familia*	.032***	.0031	-.273 ***	.0751	.282 ***	.0925
Number of observations	182,192		182,007		182,007	
F – test	176.6 ***		119.1 ***		60.9 ***	
Basic Model (1998-2000 only)						
School with *Bolsa Escola/Familia* in 2001, assigned to year 2000	-.00004	.0061	-.157	.230	-.054	.267
Number of observations	68,322		68,204		68,204	
F – test	74.2 ***		9.61 ***		15.5 ***	
Adding School/Child Variables (1998-2005)						
School with *Bolsa Escola/Familia*	.0317 ***	.0031	-.267 ***	.075	.260 ***	.092
Computer lab	.0096 ***	.0033	-0.176 **	.069	.030	.089
Computer	.0080 **	.0036	-.060	.082	-.090	.102
Library	-.0079 **	.0031	-.181 ***	.067	-.059	.084
Teacher college	.0000	.0001	.001	.001	-.010 ***	.002
Program meal	-.0036	.0041	-.172	.108	-.341 ***	.129
Program school TV	.0004	.0023	-.105 *	.057	.278 ***	.070
Program computer	-.0144 ***	.0024	-.122 **	.056	.169 **	.071
Girl	-.0014 ***	.0003	-.053 ***	.006	.085 ***	.008
Number of observations	182,191		182,006		182,006	
F – test	158.5 ***		107.9 ***		56.8 ***	
Control variables (all regressions)						
Dummies for years 98 – 05	yes		yes		yes	
Trend x enrollment level in 98 (09)	yes		yes		yes	
Trend x states x Bolsa in 2001 (27)	yes		yes		yes	
Trend x states x Bolsa in 2002+ (27)	yes		yes		yes	
Dummies for Schools (22,774)	yes		yes		yes	

Robust standard-errors.
*** significant at 1% level.
** significant at 5% level.
* significant at 10% level.