Schooling transitions to evaluate the impact of the Bolsa Família Program in Brazil: breaking the intergenerational cycle of poverty

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Abstract

Our purpose is to evaluate the impact of the *Bolsa Família* program in Brazil on educational outcomes. Providing families with an additional income, in exchange for the children remaining in school allows for smaller setbacks to poverty alleviation and breaking the intergenerational cycle of poverty. Results are based on our primary survey data, of 15,000 households, which provides retrospective and current educational information, allowing the estimation of transition probabilities for the construction of a schooling life table. Probabilities of entrance, exit and re-entrance characterize patterns of the education cycle of our comparison groups. This life table yields the average time lived in each state, allowing to assess the average expected time attending school and the expected final individual years of study. Logistic and multinomial regressions were used to model the conditional probabilities of transition into and out of school.

Introduction

This paper`s purpose is to present results of an impact evaluation of the Brazilian social program *Bolsa Família* regarding educational outcomes. This evaluation is based on the construction of a life table for the analysed students' educational states, from which the final average expected time in school, and the time in each state can be obtained. The inputs for this table are the conditional transition probabilities within the different educational states, in and out of school, estimated through logistic and multinomial models.

One of the widely attributed aspects of poverty is the absence of means to overcome a lack of social mobility. Thus, poverty can be considered more than a sheer question of income, relating to a wider range of elements regarding access to means of achieving income, as well as cultural and political organization. Brazil is a country particularly accountable for huge income differences, where inequality is markedly greater than other nations with similar per capita incomes. This poses not only the question as to how can this gap can be reduced, but also states the urgency of this matter. *Bolsa Família* is a conditional cash transfer program that benefits roughly 11 million poor Brazilian families. It is a monthly transfer to poor households with children up to 15 years-old and/or a pregnant woman; and to households in extreme poverty regardless of composition.

Through the requirements of pre-natal care (in the case of pregnant women), and the follow-up of health conditions of newborns, as well as maintaining a school attendance rate higher than 85%, with proper notification of the reason for absence (in the case of school age children), the program aims to address a part of the considered key elements of poverty. Specially, although the parents are the beneficiaries of the money transfers, newborns and children are targeted in the attempt to break the intergenerational cycle which seizes those individuals' future opportunities due to their unfavorable growing up conditions. Hence, by providing families with an additional income, in exchange for the children remaining in school instead of becoming young age, unqualified workers, allows the foundation of smaller setbacks to poverty alleviation.

The eligibility income thresholds were set at R$50 (US$18[1]) *per capita* for the extremely poor, and at R$100 (US$36) *per capita* for poor households. The extremely poor households in the program are entitled to the basic benefit of R$50 (US$18). All selected households, poor or extremely poor, get R$15 (US$5) for each child up to a maximum of three

[1] Exchange rate in January 2005

children. Therefore, the maximum amount of a transfer that an extremely poor household can get is R$95 (US$34); for poor households the maximum transfer is R$45 (US$16). The programme started in 2003, merging existing conditional and unconditional cash transfer programmes of the Federal Government. The creation of *Bolsa Família* was followed by a huge expansion until it reached the goal of 11 million households by the end of 2006. *Bolsa Família* aims: i) to alleviate the income deprivation of poor households; and ii) to break the intergenerational cycle of poverty. The first objective is to be achieved through the basic and the variable income transfer; the second through the enforcement of conditionality compliance in education and health.

This analysis considers only the first 8 years of the regular school system, which refers to a time considered standard. Therefore, the final result, estimated expected time in school, is interpreted as the time a person will take to accomplish this first stage of schooling. The proper age for the attendance of this first educational stage is between 7 and 14 years however, considering educational imbalances, this analysis will comprehend the individuals between 7 and 21 years old.

It is estimated, from the participation in *Bolsa Família*, a higher yield, in terms of schooling duration. Given that the beneficiary families find themselves in highly risky social conditions, children are usually strained from school to try and help out in the family budget. If schooling expectation indeed improves significantly through participation in the program, as preliminary data suggests that it will, then one main achievement towards fulfillment of the agenda against poverty will have been accomplished.

The small number of works using this same methodology has to be pointed out, mostly because of the lack of proper data. This result should bring an important contribution and valuable indication towards future findings on the subject.

Evaluation Methodology

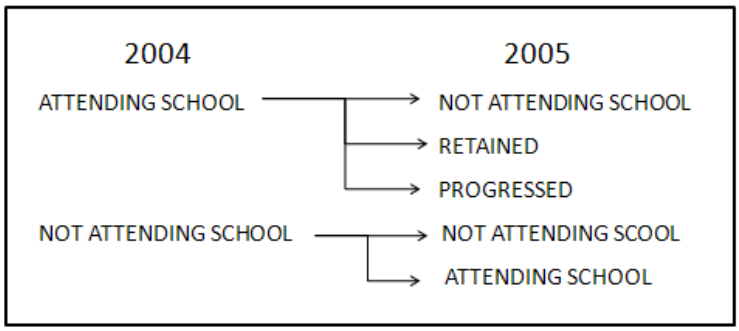
Conditional probabilities

The first step in this analysis is to estimate the conditional probabilities of transition into and out of school. These movements between the educational states are the basis for the construction of an increment-decrement life table. Logistic and multinomial regressions were

used to model the probabilities, male and female trajectories are treated separately, as well as the comparison groups (Treatment and Comparison).

Based on the used data, the schooling states were split among the following possible transitions:

Figure 1: Definition of possible transitions



Individuals that attended school in 2004 might have been attending in 2005 or might have left school. Reasons to leave school are concluding or dropping out, both of which are not separated here. Yet, individuals that attended school in the *x* grade in 2004 might be attending school in the x, meaning retention, or x+1 grade in 2005, meaning progression.

It is worth mentioning that Brazilian educational cycle, unlike a number of systems elsewhere, is not solely determined by age. Although there is a completion period considered as standard, which usually takes 8 years, preceded by one year of pre-school, the progression throughout those years is determined by scores obtained in evaluation tests. Such scores vary from school to school as do the actual evaluation criteria, but this method is used in most institutions throughout the country. Therefore, if the required results are not achieved by the students, they are to re-take the same school year for as long as necessary, until the student is considered apt for progression. The main outcome, in terms of schooling duration, is that longer periods can either be a good or a very bad thing. If student progress, as would normally be the case, the more years, the better schooling results. On the other hand, if most students do not achieve the required progression scores, they will be retained and have to repeat the same school year. This results sn an increase of the number of years attended, but no improvement in educational level is obtained, for the student will re-take the same classes due to considered insufficient learning in the previous year.

For individuals that were not attending in 2004, there are two probabilities of transition: to remain out of school or to enter school. The transition into school might mean re-entrance or a first entrance (in general for 7 years old children).

The logistic regression estimation was used to model the probabilities of transition for the individuals not attending school. The responses variables are binary, indicating if the person has changed state, into school, between 2004 and 2005, or continued at the same state, out of school. The transition probability is based on the explanatory variables which are age, sex and benefit condition.

For the individuals attending school in 2004, a multinomial regression was used to obtain the probabilities of transition between the states, as given in Figure 1. There can be three different responses for this regression, the transition states out of school, progressed or retained. The transition probability is also based on the explanatory variables age, sex and benefit condition.

These two regressions were estimated, at first, only by age, resulting in probabilities for the entire sample. After that, benefit condition was included, to capture the effect of the *Bolsa Família* program on the transitions, and, at last, the transitions were modeled with the variable sex, capturing gender differentials.

The Life Table construction

The next step in our analysis is to introduce these estimated conditional probabilities in "schooling life tables". A life table is an important method when estimating probabilities for some event, and through this approach, a methodology similar to the construction of a life table is applied for schooling information. That is, the studying life span of an individual shall be presented in terms of years expected for the completion of what is considered the standard schooling, or, alternatively, until evasion occurs. The possible increments to the table are the entry rates, which can also be interpreted as the return from evasion. Exits can occur either through evasion or conclusion. The odds of progression, retention and evasion followed by return will determine how much time an individual spent studying. The calculations for the life table enable a longitudinal approach, namely, the follow up of a synthetic cohort throughout the years. Then, the estimated years of school attendance will represent the schooling extent of the average student, similar to the life expectancy interpretation in the Life Table.

Considering the surviving population of students and no students in time t-1, and the school attendance rate (P) in time t, the survivors, l(x), in each state is given by:

$$l_{(x+1)} = P_{(x)} * l_{(x)},$$

where the elements l(x+1) represent the number of people in state i at age x, who were in state j at the age x+1; and the elements in l(x) represent the number of people in state i at age x, who were in state j at the age x-1. The person-years lived in each state, between the ages x and x+1, is given by the approximation:

$$L_{(x)} = \frac{1}{2}\left((l_{(x)} + l_{(x+1)})\right).$$

and the person-years lived between the age x until the last survivor is:

$$T(x)^k = \sum_{i=0}^{\infty} L(x+i)^k.$$

The life expectations can be, therefore, estimated. This expectations refers to the time lived in each of the considered states.

$$e(x)^{(ij)} = \frac{T(x)^{ij}}{l(x)^i}$$

The expectation relate the person-years lived above the age x in sate j considering only the ones who survived to the exact age x in state i. It results in an expectancy in state j, given the individuals in state i at age x. Hence, the multi-state table provides the life expectancy based on the states considered, that means that the expectations are conditional. Considering active as being a student, and inactive as not student, it is an active (or inactive) life expectancy, given reaching the age x as active (or inactive).

Database description

Results are based on the data of the first round of the field survey for the Impact Evaluation of the *Bolsa Família* program (AIBF). Although, by definition, the first round of a survey cannot be used to do the final impact evaluation, a basic exploration is made of the estimated differentials between the treatment and comparison groups, which help to give a preliminary perspective of the potential impacts of the program. This methodological restraint must be borne in mind when interpreting the results. The size of the sample was defined to be representative of three large areas of the country – the Northeast (NE) region, the Southeast

and South regions (SE-SOUTH) and the North and Midwest regions (NO-CO). The data collecting operation occurred in November 2005. This resulted in a total of 15,240 questionnaires collected during the field work.

The household groups were classified in terms of eligibility, Treatment and Comparison, in accordance with the information collected in the questionnaires. It should be mentioned that the operationalization of the definition of permanent household income is as close as possible to that regularly used, including the earnings from work, retirement and old age pension, and alimony. Within each sub-sample of eligible households, the first defined group called "Treatment" consists of the households that claim they currently receive the *Bolsa Família* allowance. The "Comparison" group consists of households, within the eligibility boundary, that said they have never received any kind of allowance, although registered in a public program. The final studied sample contains 10.854 households, including 5.904 in the Treatment group, and 3.547 in the Comparison group.

The AIBF survey questionnaire provides retrospective educational information for all individuals in the household, for a year before the survey. This data, added to the current educational information, allows the estimation of transition probabilities, based on the observed behavior. There are questions about school attendance and educational grade for 2004 and 2005. These observed transitions constitute the input for the construction of a schooling life table for persons of 7 to 21 years of age. The probabilities of entrance, re-entrance and exit characterize patterns of the education cycle of our comparison groups.

Results

Estimated conditional probabilities

The results for the conditional probabilities of those out of school in 2004, as seen in Figure 2, show that the largest probability of transition into school in 2005 is for the Treatment group, the beneficiaries of the *Bolsa Família* program. For the Comparison group, the probability of staying out of school during 2004 to 2005 is larger. These results are expected, due to the school attendance conditionality of the *Bolsa Família* program. Comparing the gender groups (Figure 3), women present the largest probability of entering and the smallest of remaining out of school.

Figure 2: Probability of transition for selected group: not attending school in 2004 - comparison and treatment

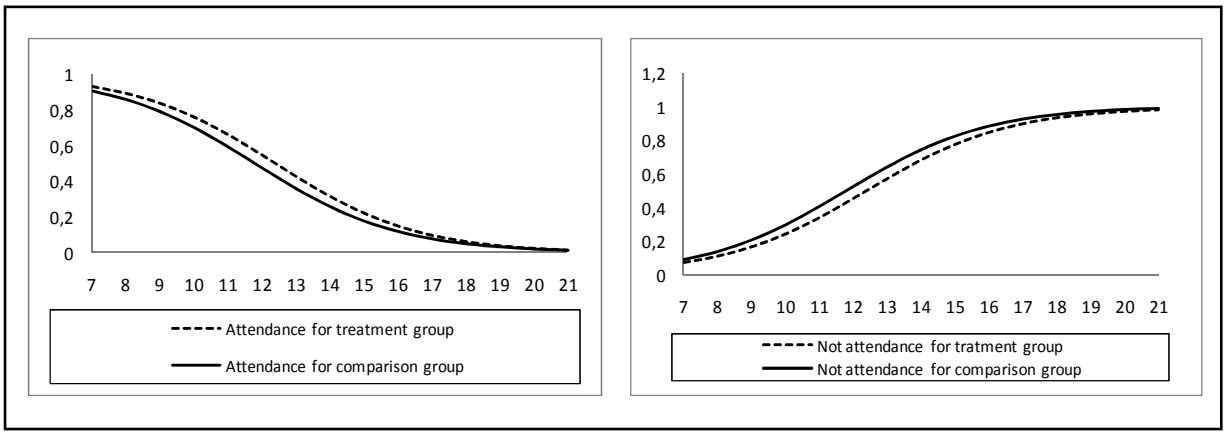
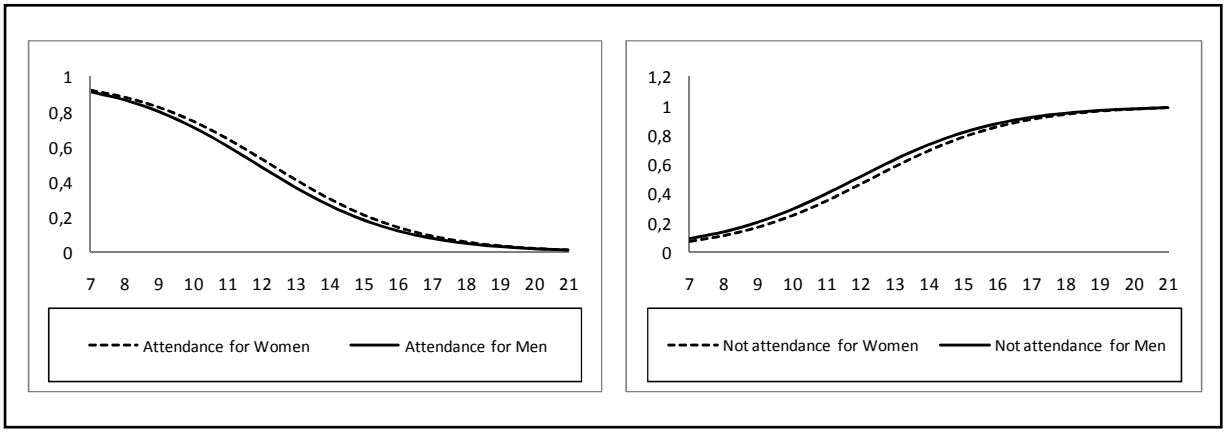


Figure 3: Probability of transition for selected group: not attending school in 2004 – gender groups



Conditional to attending school in 2004, results show that the probabilities of dropping out/ concluding, as well as advancing in the schooling grade (Figure 4), are favorable to the Treatment group. Controlling for age, the Comparison group is more likely to progress between grades among the youngest population. For the individuals older than 15 years of age, this behavior is reversed, and the probability of progressing is larger in the treatment group.

Regarding the probabilities of grade retention (Figure 5), we found a larger probability of retention within the Treatment group. This difference could be interpreted as unfavorable to the *Bolsa Família* beneficiaries, but caution should be taken in this interpretation since the

mere fact that these beneficiary children in the program have less dropouts, that is, they stay in the school system one year after the other, may be leading to a lower approval rate at first glance.

Figure 4: Probability of transition for selected group: attending school in 2004 – comparison and treatment

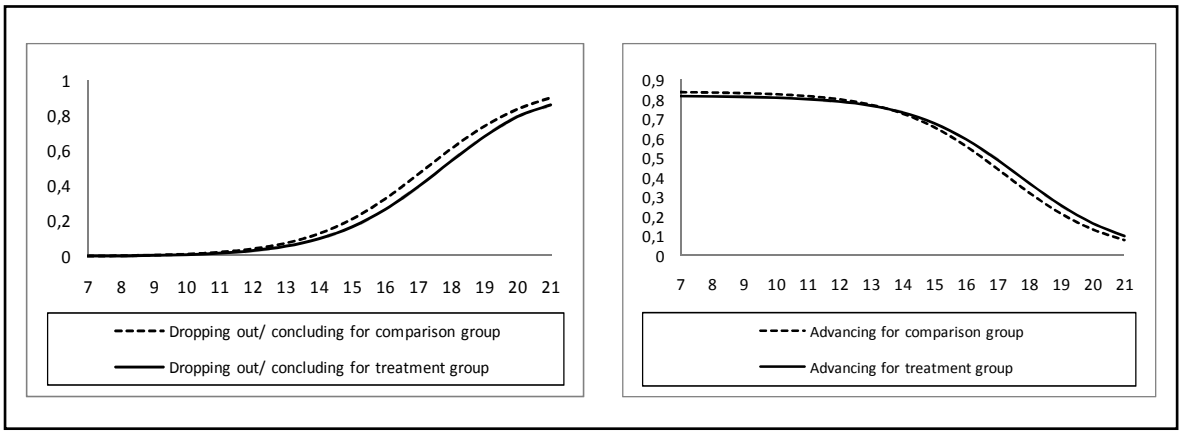
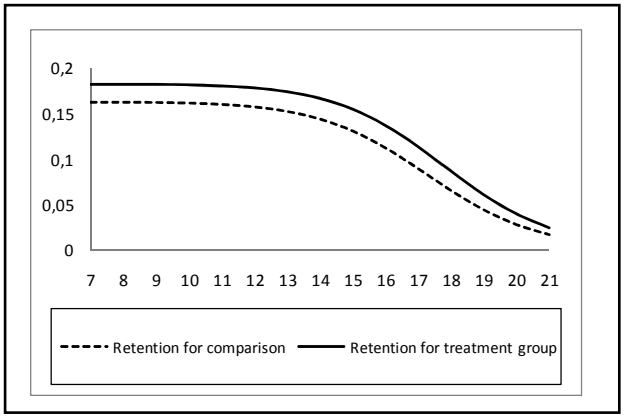
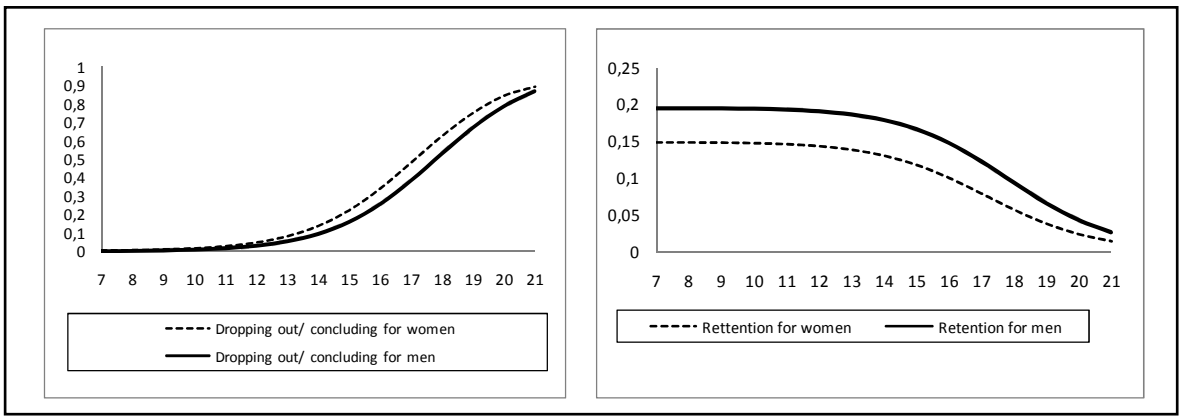


Figure 5: Probability of transition for selected group: attending school in 2004 – comparison and treatment



Follow-up and evaluation at subsequent points in time may show different evidences. The analysis by gender (Figure 6) indicates that results are better for women, whose probabilities of retention are lower. The dropout/concluding rates are almost the same for both groups.

Figure 6: Probability of transition for selected group: attending school in 2004 – gender group



The life table results

The life table provides some indicators, as the time proportion that will be lived in the active student state up to 21 years-old, and indicators that can be used to compare selected groups. It has to be considered, when analyzing these results, how difficult it is to obtain data that allows this evaluation methodology. The data used in the construction of this life table refers to the years of 2004 and 2005 only, and, therefore, the results have some kind of limitation. However, it will help to give a preliminary perspective of the *Bolsa Família* program impacts.

The life expectancy estimates, at the age of 7, a probability of 14,94 years lived. A regular person, entering school with 7 years of age would complete the standard first stage of schooling in 8 years, meaning 54% of the expected time to live as active. For those at the entering age in the Treatment group, if in active state, that means studying, the expectation is to live 55% of this time as progressed, and 13% as retained. The results for the Comparison group yield the differences caused by the *Bolsa Família* program. As the transition probabilities has stated, the Comparison group has a life expectancy in active state smaller than the Treatment group, due, mostly, to higher retained time on this last group. At the age of 7, 53% of the time will be spent in active state and 11% of the time is spent as retained for the Comparison group.

Hence, for Treatment, a person studying at the age of 7 will spend 32% of this time out of school, or the age for completing or dropping out this standard schooling stage is around 17,2 years old. For comparison, 36% of the time will be spent out of school, and the

completing/drooping out age is 16,6. At the exact age of 14, when one is supposed to complete the schooling stage, there is still 41% of the remaining time to be lived as student, for Treatment, meaning that the conclusion/dropping out will happen at the age of 17,4. For those in comparison group, this age is 16, 35% of the remaining time will be lived as active. The age expectancy of concluding or dropping out of school is older for Treatment, given that they will spend more time in school.

When comparing the initial state, for those inactive at any age, a longer time studying is expected when compared to someone at the same age in active state. Therefore, the expected age of concluding/dropping out for someone active in older ages is higher than in younger ages. This can be due to an age imbalance in school grades that has a bad influence on the student's performance leading, therefore, to more time spent in school.

When comparing the gender groups, the results are always favorable to women. Their expected time in active state is smaller, being either in or out of school initially, meaning bigger progression and smaller retention. The expected age concluding or dropping out of school is, thus, smaller for women.

Table 1: Life expectancy in active state - selected group: Treatment

Age	Total life expectation	Expected years in active state			Time proportion		
		Active		Inactive	Active		Inactive
		Progression	Retention		Progression	Retention	
7	14,94	8,18	1,92	9,53	0,55	0,13	0,64
8	13,95	7,27	1,83	9,06	0,52	0,13	0,65
9	12,95	6,46	1,65	8,10	0,50	0,13	0,63
10	11,95	5,65	1,47	7,11	0,47	0,12	0,59
11	10,96	4,84	1,28	6,12	0,44	0,12	0,56
12	9,96	4,05	1,10	5,14	0,41	0,11	0,52
13	8,96	3,26	0,91	4,18	0,36	0,10	0,47
14	7,97	2,51	0,73	3,24	0,32	0,09	0,41
15	6,97	1,81	0,55	2,36	0,26	0,08	0,34
16	5,98	1,19	0,39	1,58	0,20	0,07	0,26
17	4,98	0,69	0,25	0,94	0,14	0,05	0,19
18	3,99	0,33	0,14	0,48	0,08	0,04	0,12
19	2,99	0,13	0,07	0,20	0,04	0,02	0,07
20	2,00	0,04	0,03	0,07	0,02	0,02	0,04
21	1,00	0,01	0,01	0,02	0,01	0,01	0,02

Table 2: Life expectancy in active state - selected group: Comparison

Age	Total life expectation	Expected years in active state			Time proportion		
		Active		Inactive	Active		Inactive
		Progression	Retention		Progression	Retention	
7	14,94	7,94	1,63	8,96	0,53	0,11	0,60
8	13,95	7,02	1,55	8,51	0,50	0,11	0,61
9	12,95	6,19	1,39	7,57	0,48	0,11	0,58
10	11,95	5,36	1,23	6,58	0,45	0,10	0,55
11	10,96	4,54	1,06	5,60	0,41	0,10	0,51
12	9,96	3,73	0,90	4,63	0,37	0,09	0,46
13	8,96	2,95	0,73	3,68	0,33	0,08	0,41
14	7,97	2,20	0,57	2,77	0,28	0,07	0,35
15	6,97	1,52	0,42	1,93	0,22	0,06	0,28
16	5,98	0,94	0,28	1,22	0,16	0,05	0,20
17	4,98	0,50	0,17	0,67	0,10	0,03	0,13
18	3,99	0,22	0,09	0,31	0,05	0,02	0,08
19	2,99	0,07	0,05	0,12	0,02	0,02	0,04
20	2,00	0,02	0,02	0,04	0,01	0,01	0,02
21	1,00	0,00	0,01	0,01	0,00	0,01	0,01

Table 3: Life expectancy in active state - selected group: Women

Age	Total life expectation	Expected years in active state			Time proportion		
		Active		Inactive	Active		Inactive
		Progression	Retention		Progression	Retention	
7	14,96	8,03	1,56	9,00	0,54	0,10	0,60
8	13,97	7,11	1,48	8,54	0,51	0,11	0,61
9	12,97	6,27	1,33	7,59	0,48	0,10	0,59
10	11,97	5,42	1,18	6,60	0,45	0,10	0,55
11	10,98	4,59	1,03	5,62	0,42	0,09	0,51
12	9,98	3,77	0,88	4,64	0,38	0,09	0,47
13	8,98	2,97	0,72	3,69	0,33	0,08	0,41
14	7,98	2,21	0,57	2,78	0,28	0,07	0,35
15	6,99	1,52	0,42	1,95	0,22	0,06	0,28
16	5,99	0,94	0,29	1,23	0,16	0,05	0,21
17	4,99	0,50	0,18	0,68	0,10	0,04	0,14
18	4,00	0,22	0,10	0,32	0,05	0,03	0,08
19	3,00	0,07	0,05	0,13	0,02	0,02	0,04
20	2,00	0,02	0,02	0,04	0,01	0,01	0,02
21	1,00	0,00	0,01	0,01	0,00	0,01	0,01

Table 4: Life expectancy in active state - selected group: Men

Age	Total life expectation	Expected years in active state			Time proportion		
		Active		Inactive	Active		Inactive
		Progression	Retention		Progression	Retention	
7	14,92	8,09	2,01	9,51	0,54	0,14	0,64
8	13,93	7,19	1,92	9,06	0,52	0,14	0,65
9	12,93	6,39	1,72	8,11	0,49	0,13	0,63
10	11,93	5,60	1,53	7,12	0,47	0,13	0,60
11	10,94	4,81	1,33	6,13	0,44	0,12	0,56
12	9,94	4,02	1,13	5,15	0,40	0,11	0,52
13	8,95	3,25	0,94	4,19	0,36	0,10	0,47
14	7,95	2,51	0,74	3,25	0,32	0,09	0,41
15	6,96	1,82	0,56	2,37	0,26	0,08	0,34
16	5,97	1,20	0,39	1,59	0,20	0,07	0,27
17	4,97	0,70	0,24	0,94	0,14	0,05	0,19
18	3,98	0,34	0,14	0,48	0,09	0,03	0,12
19	2,99	0,13	0,07	0,20	0,04	0,02	0,07
20	1,99	0,04	0,03	0,07	0,02	0,01	0,03
21	1,00	0,01	0,01	0,02	0,01	0,01	0,02

Final comments

This work attempted to make an initial evaluation of the Brazilian social program *Bolsa Família* regarding educational outcomes. The importance of this analysis is due to the educational conditionality the program requires for someone to be a beneficiary, which is school attendance rate higher than 85%. This conditionality brings two advantages, the decrease in the number of drop-outs, and higher rates of attendance throughout the school year.

The results showed that participating on the social program leads to a longer time spent in school, represented by a figure larger than the regular 8 years of standard school. Staying more time in school initially seems like a good thing, but it might mean taking more time to complete the grades and leaving school improperly at an older age. Given that the beneficiary families find themselves in highly risky social conditions, children are usually strained from school to try and help out in the family budget. It is known that being out of school causes more difficulty to complete the grades, resulting, futurely, in more years retained.

These results should not be interpreted as unfavorable for the *Bolsa Família* program. The increase in the attendance for those in the highly risky conditions might be leading, year

after year, to a lower approval rate, at a first glance, but that can be explained because they are the ones having more difficulties in learning, due to their social condition.

This preliminary analysis found that the schooling expectation for the beneficiaries represents a significantly improvement on educational outcomes. It is expected that future analysis on this subject find this same expectations, leading to a more educated population in the future. Hence, we can consider that one main achievement towards fulfillment of the agenda against poverty has been accomplished.

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