Evaluation of the Impact of a Remedial Mathematic Program in Mexico City

Emilio Gutiérrez
Rodimiro Rodrigo
(2011)

Abstract

This paper evaluates the impact of an intervention targeted at marginalized low-performance students in public secondary schools in Mexico City. The program consisted on offering free additional math courses, taught by undergraduate students from some of the most prestigious Mexican Universities, to the lowest performance students in a set of marginalized schools in Mexico.

We exploit the information available in all students' (treated and not treated by the program) transcripts enrolled in the participating schools. Before the implementation of the program, participating student lagged behind non-participating ones by more than half base point on their GPA (over 10). Using a difference-in-differences approach, we find that students participating in the program observed a higher increase in their school grades after the implementation of the program, and that the difference in grades between the two groups decreases over time. By the end of the school year (when the free extra courses had been offered, on average, for ten weeks) participating students' grades were not significantly lower from non-participating students' grades.

These results provide some evidence that low-cost interventions can have important effects on student achievement.

I. Introduction

While today there is a good idea of how countries can increase the schooling of their population, little is known about how to improve the quality of the education they receive on the additional time that they spend at school. With different assumptions behind, developing countries have implemented various programs seeking to increase their citizens' human capital:

On one side there are programs that works under the hypothesis that are imperfections in the capital market the main element that forces poor people to start working early and hence under-invest in human capital, and try to reduce this barrier. This is the case of the conditional cash transfers programs like the program Oportunidades in Mexico, which generally give money to the mother by taking her children to school and to medical checks, with successful results on increasing the attendance to school as is shown in Behrman, Parker and Todd (2005), their results show positive impacts of longer exposure on grades of schooling attained (but no effects on achievement tests). On the other hand there are programs that work under the assumption that individuals are myopic and do not see the benefits of years of education and concentrate their efforts on informing students about the higher expected earnings they would perceive by completing high school or doing professional studies, such is the case of an intervention hold in Dominican Republic analyzed by Jensen (2010). In addition to strategies based on increasing the expenses on the education system like on infrastructure (Duflo, 2001), more teachers (Banerjee, Jacob and Kremer, 2004), text books (Glewwe, Kremer and Moulin, 2002), etc.

However, the evidence suggests that many of those interventions that increase schooling don't improve the performance of students on standardized tests. In other words "students often seem not to learn anything in the additional days that they spend at school" Banerjee et al. (2007). Such is the case of Mexico, where despite successful efforts to increase schooling its population faces a serious lag in terms of cognitive skills, as discussed in the later diagnostic, being placed among the last places among OECD (Organization for Economic Co-operation and Development) countries and other members of the international community, each three years since 2000 for its performance in tests to 15 year-olds population at the end of compulsory education in reading, math and science held by PISA (*Programme for International Student Assessment)* of the OCDE.

This situation has led to seek structural reforms to change the incentives for teachers, students and parents, which lead to the acquisition of useful knowledge and skills of students within schools. In that line Mexico have started programs like 'Escuela de Calidad' which aims "to set up public primary schools with a model with strategic approach to improving student learning and teaching practice, based on a scheme of social participation, cofinancing, transparency and accountability; or the program "Carrera Magisterial" which is an incentive system for teachers of Basic Education (Preschool to Secondary) by which they have the opportunity to join or to be promoted if they meet the requirements, in order to raise the quality of their performance through the recognition and support for teachers. Although because of being monetary costly like the first or because of touching political interests like the second, their impact has not arrived to the learning of students at classrooms.

Given this scenario, is that become more relevant initiatives to ensure meaningful learning of students in the Mexican Educational System, that take into account the triad of Prichett being technically realizable, politically correct and economically feasible, to accompany the big efforts seen during the last decades on expanding its capacity.

This paper presents the results of the evaluation conducted on a program that aimed to regularize in mathematics to nine grade secondary school students with high probabilities of failing, from marginal under-performance schools of Mexico City, using college students like teachers.

The program, implemented by the General Direction of Educational Innovation (DEGIFA by its acronym in Spanish) in collaboration with the Laboratory of Initiatives for Development A.C. –a Mexican NGO– and the Mexican Academy of Sciences, worked with nine graders not only motivated by the actual Mexican demography, but also since currently in Mexico in secondary school the students face severely the tradeoff between further study or desert. Is this stage which has the highest dropout rate, explaining that now over 40% of 15 years old are not in school. Also according with the National Youth Survey, 30% of them leave the school because they didn't like or didn't find it useful. Finally, it is a fact that XX% who failed the third grade of secondary (ninth grade) is a result of failing math, being very low the number of students who repeat the year, remaining with unfinished basic education.

In the other side, the "teachers" of the program are university students doing their social service, which is a prerequisite in Mexico to obtain a bachelor's degree and has the purpose that students give back to society part of the resources invested in their education through their knowledge. In contrast with similar programs in developed countries where generally teachers are graduates here the opportunity cost of participating is not as high, since almost all of them are still studying.

The program worked in average for three months. The secondary students were taken out of their classrooms to take these math remedial classes given twice a week for two hours each.

The rest of the paper is organized as follows. Section 2 reviews some recent literature that analyzes similar interventions, Section 2 makes a diagnostic of the target population in the country, Section 4 describes the one studied here, its design and the data available is presented in Section 5, and the empirical strategy as well as its results are presented in Section 6. Finally Section 7 summarizes the lessons that can be taken from this exercise in a way of conclusion.

II. Literature

Despite the growing number of programs targeting under-performing students in different countries, few of them have gotten the appropriated design since the beginning, resulting in a little evidence on their impact. Two recent exceptions, with a similar intervention to the studied here, are those analyzed in Banerjee, Cole, Duflo and Linden (2006) and Lavy and Schlosser (2005):

Banerjee et al. (2005) evaluates a remedial education program hired woman to teach third and fourth graders students in India lagging behind in basic literacy and numeracy skills in small groups. They made a randomized evaluation of the intervention in two different cities of urban India (reinforcing external validity of its results), over two scholar years 2001-2002 and 2002-2003 (making less likely that the positive results are consequences of the newness of the program), and also run on a very large-scale -over 15,000 students- for the analyzed period.

The intervention consists of a meeting of the instructor, a young woman trained for just two weeks, with the group of approximately 15-20 children in a class for two hours a day during school hours, focused on the competencies children should have learned in first and second grades. The program is of very low-cost (around 5 dollars per child per year) and easily replicable.

The authors look for the impact of the program on learning levels, measuring learning by using annual pre-tests given during the first few weeks of the school year and post-test, given at the end of the term. They found that it increased average test scores of all children in treatment schools by

0.14 standard deviations in the first year, and 0.28 in the second mostly due to large gains experienced by children at the bottom of the test-score distribution. Resulting much more cost effective than hiring new teachers (since programs reducing class size appears to have little or no impact on test scores) and also more cost effective than a computer assisted learning program implemented by the same time in a similar geographical area, analyzed in the same way there.

Lavy and Schlosser (2004) evaluates the short-term effects of a remedial-education program provided additional instruction to under-performing high-school students in Israel. The program targeted tenth to twelfth graders who needed additional help to pass the matriculation exams. They use a comparison group of schools with strongly similar characteristics to the treated, from those that enrolled later in the program and apply differences-in-differences empirical strategy.

The intervention consisted on individualized instruction in small study groups of up to five students for tenth, eleventh and twelfth graders, where the aims were to design individualized instruction based on students' needs; to increase the matriculation rate; and to enhance the scholastic and cognitive abilities, self-image, and leadership aptitudes of underperforming students. The participants were chosen by their teachers based on the likelihood of their passing the matriculation exams. Although no quantifiable measure was used to apply this, teachers were instructed to select students who had up to three failing students, focusing the remedial classes, held after school hours and taught by the classroom teachers, on these subjects.

They focused their analysis on the first year of implementation after the pilot because of the few schools that participated at that time (just 10 schools) thus 1998-1999 is considered the pretreatment year, and 2000-2001 the treatment year, in which there were 4,100 students affected by the intervention (one-fifth of all students in treated schools).

There the authors look for the effects of the program on matriculation status, which is a comparable outcome of 12 graders. They found that the program raised the school mean matriculation rate by 3.3 percentage points associated mainly to targeted participants, rejecting the existence of externalities on their untreated peers.

Also since at the same academic year other interventions based on incentives for teachers (analyzed by Lavy, 2002) and for students (analyzed by Angrist and Lavy, 2002), both with the same objectives were implemented in Israel they made a comparative analysis. They found that the positive impact estimated for the remedial program was similar to that of the teachers' incentives program but at almost twice the per-student cost. In the other side the matriculation awards program seems to double the improvement achieved by the remedial program while both present similar costs.

The present paper evaluates the impact of an intervention targeted at marginalized low-performance nine graders students in public secondary schools in Mexico City. The intervention consisted on offering free additional math courses, taught by undergraduate students doing their social service from some of the most prestigious Mexican Universities, to the lowest performance students in a set of marginalized schools. In this way, we can say that this program is also easily expanded since only in Mexico City there are around 500,000 students at University.

Here we look for the impact of the program on the achieved grades of the alumni treated, taking advantage of the availability of all students' (treated and not treated by the program) math transcripts in the participating schools and in some other control schools before and during the intervention of the program. The question is if the remedial math program is able to remedy the situation of the lagged students by improving their current grades.

Before the implementation of the program, participating student lagged behind non-participating ones by more than half base point on their GPA (over 10). Using a difference-in-differences approach, we find that students participating in the program observed a higher increase in their school grades after the implementation of the program, and that the difference in grades between the two groups decreases over time. By the end of the academic year, when the free extra courses had been offered, for around ten weeks –much more small than the programs described above-participating students' grades were not significantly lower from non-participating students' grades.

III. Secondary School in Mexico

Since 1993, Mexican Constitution states that basic compulsory education in the country includes secondary education (grades 7-9) and gives the State –federation, local governments and municipalities– the mission of ensuring the access of every individual to it. In that sense Mexico has been successful increasing the number of people attending school, while in 1990 85.8% of the population between 6 and 14 year old attended to school, by 2010 this ratio grew up to 94.7%. Also looking at the average schooling of 15-year-olds we found a relevant increase from 6.5 years in 1990 to 8.6 years in 2010, which means an increase of more than two years in the last two decades.

Nevertheless the dropout in this secondary education is still severe. By 2010 40% of 15 years old were already out of the school, without the certificate of having completed the secondary school. Many times it happens even when the student courses the hole secondary by failing one or more courses in 9th grade[1]. This certificate is relevant not only for statistics (people with basic education completed), but also because even if after time of being in the labor market an individual in this situation seems profitable to go back to school to high school or to make a technical carrier, it is costly because first she needs to get back to get this certificate in order to pursuit her goal.

Now even if a low-performance-student by a sort of things approves all its courses does not mean she has the competences necessaries for the labor market, which is the case of a large group of secondary students. According with ENLACE 2010[2] 40% of secondary students has an insufficient

[1] The XX% of the cases because of failing mathematics

[2] ENLACE is a national standardized test that measures the cognitive skills of basic education students in Mexico.

level on verbal ability and another 40% does not exceed the level of elemental; 53% has an insufficient level on mathematics and another 34.7% does not exceed the level of elemental in this ability. Consequence of this incapacity of the educational system to have young people in schools learning is the fact that of the more than 33 millions of young between 12 and 29 years, 7.1 millions don't study neither work, with a high cost for the country.

So motivated by the believe that most of the times, the big size of the classrooms and the old pedagogical techniques of the teachers mixed became the perfect scenario to make low performance students failed or drop out because of feeling lost in class, this program provides to nine graders students from marginal under-performance schools in Mexico City with high probabilities of failing by an undergraduate student, who by construction is an element that grew up in a very special environment (according with OCDE (2010) around 30% of young adults study this level in Mexico), as a teacher. Not only because of the low cost[3], but also in order to provide this target population of someone with good math background and leadership skills in small groups, so that receive the enough attention and confidence to solve all their doubts.

IV. The Program

The program operated by the local representation of the Minister of Education (SEP) in Mexico City in collaboration with the Laboratory of Initiatives for Development (LID by its acronym in Spanish) a local NGO was run at the second half of the academic year 2009-2010 specifically from April to June 2010 in 33 schools of 11 different delegations[4]. The program provided the participant schools with an advisor which was an undergraduate student to work as a teacher with ninth grade underperformer students.

The intervention typically consists in a meeting of two advisors with a group of up to 20 students, two days a week for two hours during school hours. This extra help focused on develop on children the mathematical skills needed to pass the course. The assessors were provided with the curriculum of mathematics at secondary, a past "extraordinario" exam and were instructed to look at children notebooks to and continuously be asking the group their doubts in order to adapt their classes to the group necessities[5].

There were in total 55 advisors, from three of the most prestigious universities in the country UNAM, ITAM, and UP the first one public and the other two privates, who throw the program, accredited their social service -one of the requirements to get titrated from university in Mexico. By this point is relevant to point out that there is a wide range of the common activities that

[3] In fact we could say a zero cost, since it accounts to undergraduates as social service which is a requirement in Mexico to license from any university.

[4] Álvaro Obregón, Benito Juárez, Coyoacán, Cuauhtémoc, Gustavo A. Madero, Iztapalapa, Magdalena Contreras, Tlahuac, Tlalpan y Venustiano Carranza.

[5] This brief but useful training to undergraduates and future advisors was given by the Mexican Academy of Science (AMC by its acronym in Spanish).

undergraduates can do as social service that goes from being research assistant (activities that promote the accumulation of human capital of the participants), taking care of old people or participate of reforest campaigns (that promote the social capital), until developing mechanical jobs for a social organization or a governmental agency (activities like making photocopies, that does not add value) being these last a common case. So the expansion of this program could help to replace the last kind of social service mentioned.

The advisor-schools match occurred as follows: (a) "teachers" recruited communicated the coordinators of the program the colony they preferred to perform their service according to their school activities and geographical location during the day, (b) coordinators located 3 schools ranked among the worst at ENLACE 2009 test willing to receive the program, (c) the student ordered them according to their schedule and geographic preferences and taking into account such information coordinators assigned schools. Within these schools, the principal in coordination with the teachers were supposed to form groups of up to 20 students at risk of failure, based on scores of the three partial exams done by then.

During the remedial classes, the advisors were asked to pass assistance of their students, which had to be also signed by the teacher and the principal of the children attended. So we can know that there were in average 13 children per group at the beginning of the program, and 12 at the end of it.

As have been said the main characteristics of the program are that is low cost and easy replicable, because is based on the principle of harness the richness of the human capital concentrated in universities to reinforce the mathematical abilities of young students from secondary school, by changing the typical environment of this low performers secondary students for a small classroom -what means more real attention to their necessities and difficulties-, with a younger teacher -that not only inspires more confidence, but also that present physically to the children an example of the useful that learning can be as it is the university students.

V. Evaluation Design

For the study, we have a panel data formed by the scores of the five partial exams (applied during the academic year each two months to high school students) in mathematics for all students attending the third grade of secondary schools that were part of the program, taking into account that the intervention started just after the third partial exam was applied; as well as information on socio-economic, infrastructure and the schools' academic performance for each of the 33 schools and personal characteristics of the "teachers" (college students).

In contrast with Banergee (2005) where is applied a standardized test before and after the intervention, here the scores observed correspond to exams constructed, scaled and graded by the official teacher at each school. In that sense there is a high factor of subjectivity that could lead us to think we are trying to compare incomparable things, nevertheless since there was the same subjectivity before and after the intervention we can argue that the measurement error is the same for the five periods leaving unbiased our estimates for the treatment effects.

Table 2 reports the average scores of 9th graders in Mathematics for the five partial exams as well as for the average of the first three partials and the last two which were done before and after the intervention started to work. Looking at students within treated schools we can see that students selected to receive the program (Column 1) were worse performers than their classmates (Column 2) for partial exams 1, 2 and 3, but as it can be seen up in the left side of Figure 1 the gap between both groups get reduced by partial exam 4rd and even disappeared by partial exam 5. The same observation can be done by looking at the Simple Differences made between treatment and control group within treated schools shown in Column 3 (and down in the left side of Figure 1) that are of more than half of a point (over 10) and statistically significant for the three first partials but reduced around 70% for the fourth partial exam and a difference near to cero for the fifth period, in both cases the difference is not statistically significant different from cero.

Also taking advantage that we have available information for around 60 more schools in Mexico City with similar characteristics we expand the control group to all the non-treated students in the schools in the sample (Column 5) and it can be seen the same gap in average scores in the first three partial exams when comparing with the treated group as is shown in Column 6 where the simple differences are presented. Here we see a similar history than when comparing students within schools, as can be seen in Column 6 and graphically in the right side of Figure 1 the low performance students attended overcome the gap in average scores with the non-treated students in the sample in the fourth and fifth partial exam after having received the remedying classes. So at least by this level of analysis the program appears to be successful on helping low performance nine graders students to get similar scores in mathematics than their classmates.

VI. Impact of the treatment

Our estimation strategy will consist of comparing the average score on all five partial exams, and the differences in them for the treated and non-treated students. We present different results, changing the sample used (excluding and including non-treated students in non-treated schools) and including increasing controls. The basic regression estimated will be the following:

$$Score_{it} = \sum_{t=1}^{5} \emptyset_t Period_{it} + \sum_{t=1}^{5} \emptyset_t Treatment_{it} * Period_{it} + \epsilon_{it} \qquad (1)$$

Where $Score_{it}$ measures the grade of student *i* in partial exam *t* (1 to five). $Period_{it}$ is a set of five dummy variables, taking value of one for each period. $Treatment_{it}$ is a dummy variable that takes value of one if student *i* is treated (participates in the remedial courses); ϵ_{it} is an error term.

The coefficients estimated for the dummies for each period exam measure the average scores for the non treated students in the five exams. The coefficients estimated for the effect of the interactions between the period exams and the treatment variable measure the average differential in grades between students in the treatment and the controls groups in each period.

Treated and non-treated students are likely to be different in terms of their scholastic achievement. The treatment was only introduced after the third period. Given this, if our identification strategy is correctly identifying the causal impact of the treatment on students' scores, we would not expect to see any statistical difference in the coefficients for the interaction between the treatment and the period variables for the first three periods. As the constant is excluded from the regressions, the coefficient on these three variables will simply capture the differences in grades between the treatment and control groups in the absence of the remedial courses.

The impact of the remedial courses will then consist of comparing the coefficient for the interaction between the treatment and period variables for the last two periods, with those of the first three periods. This estimation strategy allows us then to identify if the trends in exam grades were similar before the implementation of the remedial program for the treatment and control groups, and also evaluate if its effects increase or decrease between the fourth and the fifth periods.

The results of estimating equation 1 are shown in Table 3. As can be seen, the coefficients for the interaction between the treatment and period variables are negative and significantly different from zero for the first three periods both when restricting the sample to all students in treated schools (Column 1) and including all students in treated and non-treated schools (Column 2). The coefficient for the interaction between the treatment dummy and period 4 is significantly lower in magnitude than those for the first three periods. The grade gap between the treated and non-treated students seems then to decrease after the implementation of the program. Perhaps more interestingly, the coefficient for the interaction between the treatment and period 5 dummies is close to zero and insignificant when the sample is restricted to students in treated schools (suggesting that the program might have completely closed the performance gap between the two groups after ten weeks of its implementation). When including students in non-treated schools in the sample, this coefficient remains significantly negative, although still smaller in magnitude than that for period 4.

Nevertheless it is still the doubt if the improvement in the average scores of the treatment group was caused by the undergraduates' sessions because the reduction in the gap appears to begin since the third exam.

As stated before, students in the controls and treatment groups are likely to be different (and the differences in their partial grades before the implementation of the program suggests they indeed are). In order for our empirical strategy to correctly identify the impact of the program, the assumption that the trends in treated and non-treated students' performance (measured by their scores in the period exams) would not be different in the absence of the program must hold.

While we cannot directly test this assumption, we can investigate if these trends were actually different during the first three periods, before the implementation of the remedial courses. If the closing of the grade gap between the two groups is indeed due to the existence of the program, it should be constant over time before its implementation.

Figure 1 plots both the average scores in the partial exams for both the treatment and control groups, and the difference between them for both the sample including and excluding students in non-treated schools. As can be seen, according to the bottom graph of the left panel, the grade gap seems to start decreasing since period 3, before the implementation of the program. However, as can be seen in the top graph of the same left panel, this decrease in mainly driven by a reduction in the average scores of the non-treated students. The right-hand side panel shows that, when including all students in treated and non-treated schools in our sample, the grade gap is fairly constant during the first three periods, and only starts decreasing from the fourth period, after the implementation of the remedial courses. These results raise concerns on our findings being unbiased estimated of the impact of the remedial courses, as we cannot conclude that the trends in grade gaps were constant over time before the implementation of the program (at least when not including non-treated schools in our sample).

<u>Controlling for initial conditions of students</u>

Given this, in order to better control for confounding factors that can be driving the changes in the grade gap between treated and non-treated students, this section investigate the changes in this gap by controlling by more control variables than in equation (1).

The selection rule used by school teachers to assign students to our remedial program is not known to us. If, as is evident, worse performing students were more likely to be assigned to the program, and if the trends in test scores between these students and those non-treated is different, our estimated coefficients in the previous section will not be correctly estimating the impact of the program. However, as we observe students' performance in more than one partial exam before the implementation of the program, in order to get more precise estimators and taking into account that test scores have a strong persistent component, we add to equation 1 the interactions between the score in the first partial exam and the dummies of partial exams 2 to 5 in order to control for the differences in scores among students caused by the score achieved in the first partial test as a proxy of their initial mathematics abilities and the reputation created at teachers' head. The described exercise is represented by Equation 2, and its estimated results presented in Table 4. These estimations compare scores in partial exams 2 to 5 of students from the treatment and control groups with the same scores in the first exam, getting that students in the treatment group got a lower score in the second exam, that there were no significant differences in the performance between groups in the third exam, and that people in the treatment group performed better by 0.20 and 0.34 points over 10 than people with the same score in the first exam at control group.

$$Score_{it} = \sum_{t=2}^{5} \emptyset_t Period_{it} + \sum_{t=2}^{5} \emptyset_t Treatment_{it} * Period_{it} + \sum_{t=2}^{5} \emptyset_t Score_{i,period1} * Period_t + \epsilon_{it} \qquad (2)$$

A similar control for initial conditions of students that would be desirable is to control for the differences between the scores achieved in partial 2 and partial 1 by each student. So we add to Equation 2 the interactions between the difference between scores in partial 2 and partial 1 and the dummy of partial exams 3 to 5, getting equation 3 as can be seen below. The resultant estimations, shown in Column 1 and 2 of Table 5, express the effect of the treatment on partial exams 3, 4 and 5 comparing students with similar performance at the first partial exam and similar difference between the scores achieved in partial exam 2 and 1. Getting that the students in the treatment group performed better than the control group one tenth of a point (over 10) but this is not statistically significant that the treated students performed four tenths of a point (over 10) in the fourth partial exam and more than half a point (over 10) in the fifth partial exam in comparison with students in the control group with similar initial score and similar change in scores between the first two partial exams.

$$Score_{it} = \sum_{t=3}^{5} \emptyset_t Period_{it} + \sum_{t=3}^{5} \emptyset_t Treatment_{it} * Period_{it} + \sum_{t=3}^{5} \emptyset_t Score_{i,period1} * Period_{it} + \sum_{t=3}^{4} \emptyset_t \Delta Score_{i,period(2-1)} * Period_{it} + \epsilon_{it} \qquad (3)$$

Finally, we add to Equation 3 the interactions between the two variables used to control for the variations in the performance at the first partial exams (the score in partial 1 and the differences in scores between partial 1 and 2) getting Equation 4. The results of estimating Equation 4 for the two control groups analyzed are reported at Column 3 and 4 of Table 5 and are fairly similar to estimations gotten for Equation 3.

$$Score_{it} = \sum_{t=3}^{5} \emptyset_t Period_{it} + \sum_{t=3}^{5} \emptyset_t Treatment_{it} * Period_{it} + \sum_{t=3}^{5} \emptyset_t Score_{i,period1} * Period_{it} + \sum_{t=3}^{5} \emptyset_t \Delta Score_{i,period(2-1)} * Period_{it} + \sum_{t=3}^{5} \emptyset_t Score_{i,period1} * \Delta Score_{i,period(2-1)} * Period_{it} + \epsilon_{it} \qquad (4)$$

Taking advantage of the available data, the same estimations are generated for the entire sample that includes 60 non-treated schools with similar characteristics to the treated ones, what means just a significant growth on the control group called “control 2” in the right side of Figure 1. Table 4 shows the results of such estimations that are quite similar to those obtained for the analysis within treated schools presented in Table 3 explained above, where the first two columns (1 & 2) show that the program is able to eliminate the initial inequalities on the performance of students at partial class examinations, and the second two columns (3 & 4) show that comparing individuals with similar performance by the third partial exam, those who receive the remedying math classes got a bigger score of in average almost four tenths of point (over ten).

VII. Conclusion

This paper reports the results of the impact evaluation of an intervention targeted at marginalized low-performance students in public secondary schools in Mexico City, consisted on free additional math courses to the lowest performance students.

The results suggest that students participating in the program observed a higher increase in their school grades after having received the extra courses of almost 0.4 points (over 10), and that the difference in grades between the two groups decreases over time. Consistent with the history given by the simple differences which shows that by the end of the school year, when the free extra courses had been offered, on average for ten weeks, participating students' grades were not significantly lower from non-participating students' grades, eliminating the gap that in the beginning of the year was in average of around 0.5 points (over 10). Providing evidence that this kind of intervention could be an useful instrument on reducing the inequalities on student achievement inside the classrooms, and on reducing dropouts of lagged students.

VIII. References

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Table1. Operative Data

Table 1.1 Schools

Type of secondary	
General	29
Technical	18
Shift	
Morning school	15
Afternoon school	25
Both	7
Geographical location	
North	12
South	6
East	28
Center	4

Table 1.2 ADVISORS

	Female	Male	Total
Number of advisors	23	20	43
UNAM	8	5	13
ITAM	11	13	24
UP	4	2	6
Group size			
Initial size	13.1	13.7	13.4
Final size	12.0	13.0	12.4
Sessions	11.2	7.7	9.9
Total hours	27.6	31.2	29.2

Table 2. Average Scores of 9th Graders in Math Summary Statistics

	Whithin Treated Schools			Between Schools			
	Treatment	Control	Simple Differences (1-2)	All in treated schools	All non-treated in all the schools	Simple Differences (1-5)	All the schools of the sample
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Pre-treatment							
Period 1	6.2961	6.8634	-0.5599***	6.7971	6.9233	-0.6191***	6.9037
	[1.2733]	[1.4243]	[0.0573]	[1.4195]	[1.5325]	[0.0582]	[1.5045]
Period 2	6.2612	6.9454	-0.6572***	6.8663	6.9315	-0.6474***	6.9107
	[1.1904]	[1.7060]	[0.0685]	[1.6712]	[1.7553]	[0.0680]	[1.7333]
Period 3	6.2221	6.6625	-0.4133***	6.5875	6.8069	-0.5558***	6.7606
	[1.2134]	[1.5279]	[0.0820]	[2.0294]	[2.0317]	[0.0786]	[2.0338]
Average Pre-treatment	6.2597	6.8237	-0.5435**	6.7583	6.9076	-0.6074***	6.8677
	[1.0474]	[1.4574]	[0.0582]	[1.4273]	[1.5499]	[0.0589]	[1.5061]
Post-treatment							
Period 4	6.5109	6.6789	-0.1344	6.6297	6.7508	-0.2035**	6.728
	[1.2703]	[1.4579]	[0.0940]	[2.3218]	[2.3217]	[0.0899]	[2.3221]
Period 5	6.7184	6.7293	0.0235	6.6976	6.8966	-0.1389	6.8631
	[1.5595]	[2.4010]	[0.1025]	[2.5296]	[2.5164]	[0.0976]	[2.5217]
Average Post-treatment	6.6146	6.7041	-0.0555	6.6938	6.8232	-0.1712*	6.8172
	[1.2085]	[2.4010]	[0.0943]	[2.2945]	[2.3039]	[0.0894]	[2.3113]
Observations	689	5258	-	5947	16278	-	22225

Notes: This table gives the mean scores for the five partial test (and the average for those made before and after the intervention) for treatment and comparison students. Columns (1)-(3) show the average scores for the treated, the comparison, and the difference between those groups of students within the treated schools respectively. Column (4)-(6) show the average scores for all the students in the treated schools, for all non-treated in all the schools in the sample and the simple differences between the last and the treated, respectively. Column (7) shows the mean scores for all the students of all the schools in the sample. Standard errors in brackets.

* significant at 10%; ** significant at 5%; *** significant at 1%

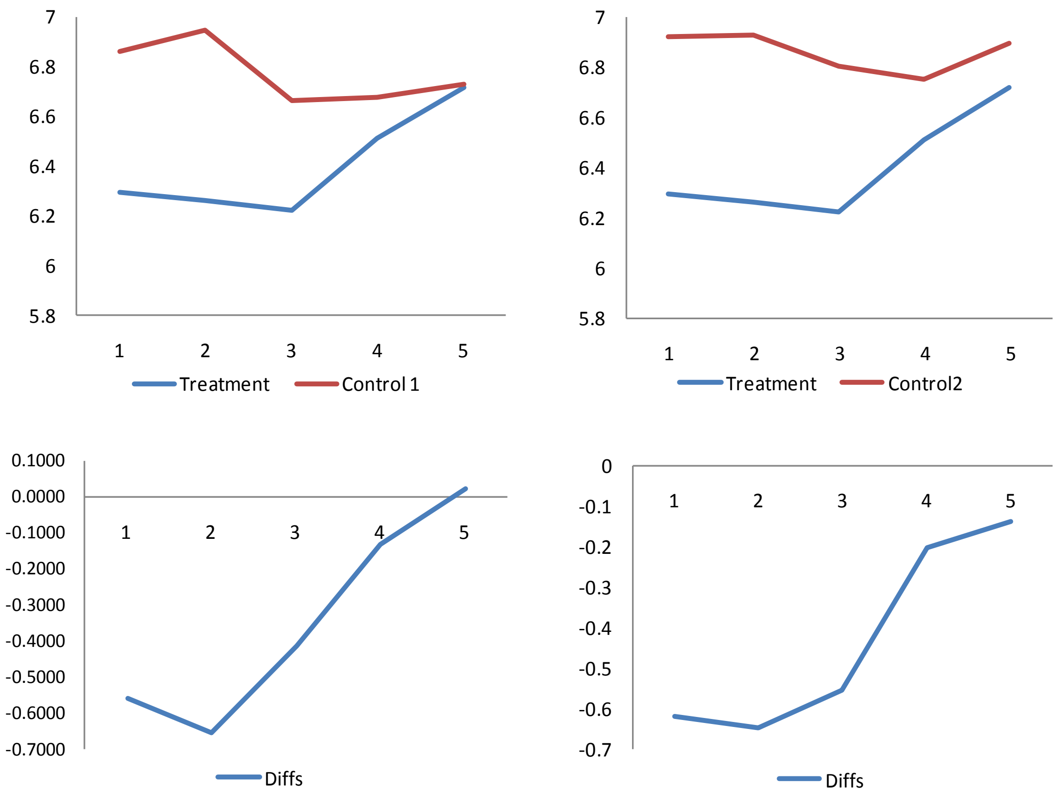

Figure 1.
In the left side it is shown the Average Scores for treated & non-treated students within treated schools, and Differences between them. In the right side, the Average Scores for treated & non-treated students among schools in the sample, and Differences between them

Table 3
Treatment effects on the Average Math Scores

	(1)	(2)
Period 1	6.9233***	6.8634***
	[0.0139]	[0.0279]
Period 2	6.9315***	6.9454***
	[0.0139]	[0.0279]
Period 3	6.8069***	6.6625***
	[0.0139]	[0.0279]
Period 4	6.7508***	6.6789***
	[0.0139]	[0.0279]
Period 5	6.8966***	6.7293***
	[0.0139]	[0.0279]
Treatment * Period 1	-0.6284***	-0.5685***
	[0.0788]	[0.0817]
Treatment * Period 2	-0.6643***	-0.6782***
	[0.0788]	[0.0817]
Treatment * Period 3	-0.5820***	-0.4377***
	[0.0788]	[0.0817]
Treatment * Period 4	-0.2341***	-0.1621**
	[0.0788]	[0.0817]
Treatment * Period 5	-0.1798**	-0.0125
	[0.0788]	[0.0817]
Observations	110005	29410
R-squared	0.92	0.92

Notes: This table reports the estimates of the treatment effect according with equation (1), taking as comparison groups: non-treated students excluding (Column (1)) and including (Column (2)) those in non-treated schools. Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 4
Treatment effects on the Average Math Scores controlling by Period 1 Scores

	(1)	(2)
Partial 2	2.0257***	2.1078***
	[0.0595]	[0.1255]
Period 3	1.9882***	2.3898***
	[0.0595]	[0.1255]
Period 4	1.8087***	2.2527***
	[0.0595]	[0.1255]
Period 5	2.3168***	2.5048***
	[0.0595]	[0.1255]
Treatment * Period 2	-0.2190***	-0.2775***
	[0.0727]	[0.0791]
Treatment * Period 3	-0.1447**	-0.0838
	[0.0727]	[0.0791]
Treatment * Period 4	0.2145***	0.2046***
	[0.0727]	[0.0791]
Treatment * Period 5	0.2359***	0.3374***
	[0.0727]	[0.0791]
Observations	88004	23528
R-squared	0.93	0.93

Notes: This table reports the estimates of treatment effect controlling by scores in period 1 like in equation (2), taking as comparison groups: non-treated students excluding (Column (1)) and including (Column (2)) those in non-treated schools. Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 5
Treatment effects on the Average Math Scores controlling by different measures of the initial performance of students

	(1)	(2)	(3)	(4)
Partial 3	0.9910***	0.9919***	0.6072***	0.6119***
	[0.1280]	[0.1282]	[0.0596]	[0.0597]
Partial 4	0.8015***	0.8104***	0.4565***	0.4632***
	[0.1280]	[0.1282]	[0.0596]	[0.0597]
Partial 5	0.9447***	0.9522***	0.9508***	0.9629***
	[0.1280]	[0.1282]	[0.0596]	[0.0597]
Treatment * Partial 3	0.1004	0.1001	0.0047	0.0038
	[0.0770]	[0.0771]	[0.0696]	[0.0695]
Treatment * Partial 4	0.3956***	0.3925***	0.3607***	0.3595***
	[0.0770]	[0.0771]	[0.0696]	[0.0695]
Treatment * Partial 5	0.5428***	0.5402***	0.3836***	0.3814***
	[0.0770]	[0.0771]	[0.0696]	[0.0695]
Controls by Partial 1 grade	Yes	Yes	Yes	Yes
Controls by changes in grades between grades in period 1 & 2	Yes	Yes	Yes	Yes
Controls by the interaction of the changes (1&2) & grade in Partial 1	No	Yes	No	Yes
Observations	17646	17646	66003	66003
R-squared	0.93	0.93	0.94	0.94

Notes: This table reports the estimates of the treated effect according with equation (3) and (4) controlling by different measures of the initial performance of students, taking as comparison groups the non-treated students excluding (Columns 1&2) and including (Columns 3&4) those in non-treated schools. Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

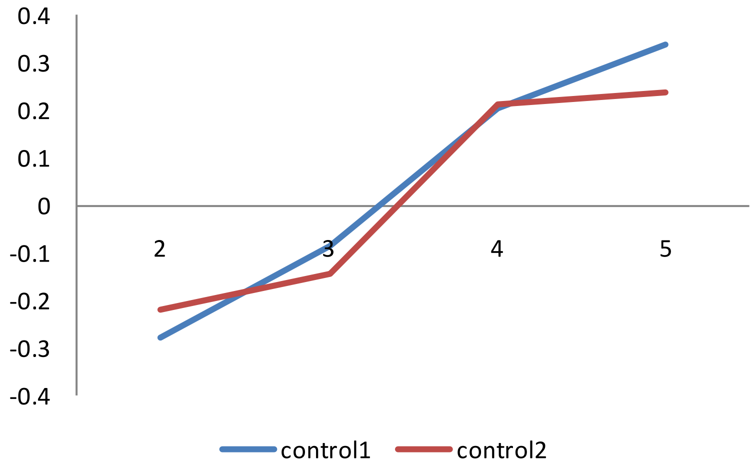

Figure 2.
The figure 2 plots the estimated treatment effects controlling by grades in period1 (equation 2) for both comparison groups of non-treated students excluding (control1) and including (control2) those in non-treated schools.

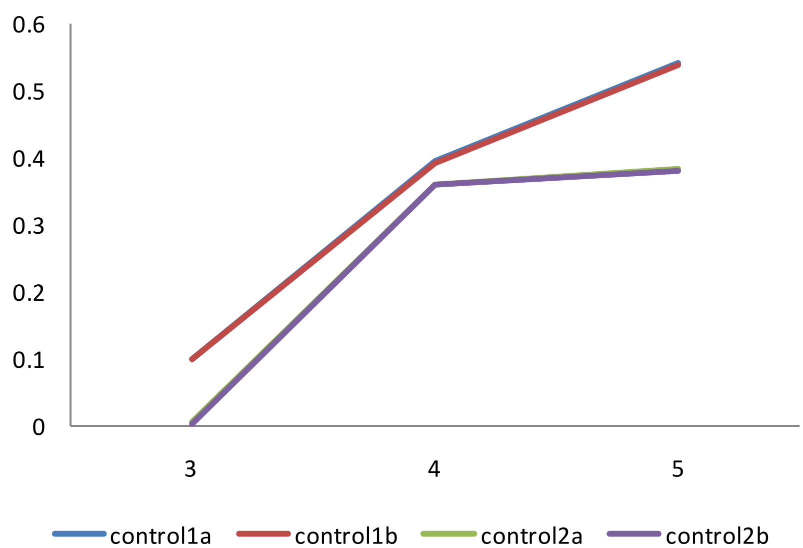

Figure 3.
The figure 3 plots the estimated treatment effects by equation 3 and by equation 4 (identified by (a) and (b) respectively), for both comparison groups of non-treated students excluding (control1) and including (control2) those in non-treated schools, which are fairly equal.