Targeting High School Scholarships to the Poor: The Impact of a Program in Mexico

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I. Introduction

Improving high school, or upper secondary school, graduation rates for children from lower-income backgrounds is often seen as important for offering access to opportunity and improving intergenerational mobility. Indeed, in many circumstances low attendance is an important issue of economic efficiency and has implications for aggregate economic growth (Hanushek and Woessmann 2012; World Bank 2018). As such, it has motivated policy in numerous countries, where financial support that goes beyond provision of free tuition is offered for upper secondary school attendance. The underlying reason often cited is that certain high-ability but low-socioeconomic-status students are liquidity constrained, which generates a wealth gradient in attendance even conditional on ability (Belley and Lochner 2007; Abbott et al. 2019). Such liquidity constraints can arise because parents may be reluctant to fund education to the level that is efficient from the child's perspective when they are unlikely to be repaid and/or because willing parents are themselves poor and constrained in their ability to borrow the required funds. This can imply that children with potentially high returns do not obtain enough schooling. Both from efficiency and equity considerations, targeting such students appropriately is likely to be of first-order importance.

In light of such arguments, the Mexican government introduced a new scholarship program in 2007, Programa de Becas Educación Media Superior

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(PROBEMS; or the High School Scholarship Program), targeted to poor upper secondary students, with the objective of increasing graduation rates and improving learning outcomes. The excess demand for such scholarships, relative to the available budget, offered the opportunity to evaluate their impact by randomly allocating them through a lottery system implemented in 2009. On the basis of this randomization, we estimate the effect of the intervention on beneficiary students' probability of graduation and on their test scores at the end of upper secondary school in 2012. Henceforth, we refer to PROBEMS as the scholarship program.

The main result we obtain is that the scholarship program had no effects either on upper secondary graduation rates or on performance in the standardized test. This surprising result may be due to mistargeting of the program. A conditional cash transfer can increase graduation rates because it alleviates liquidity constraints for some and because it reduces the cost of education, drawing in people with potentially high returns. If liquidity constraints are not the central issue and if the effort cost for lower-ability individuals is high, then it is quite possible that we do not observe an effect overall. Thus, to get a better understanding we carry out subgroup analysis while allowing for appropriate multiple testing adjustments. We find that the only subgroup of students for whom the scholarship had a positive and significant effect on the probability of graduation was the subgroup of students who had relatively high initial test scores. For students at the top tercile of the test score distribution at baseline, being awarded a scholarship increases the probability of graduation by 4 percentage points. This reinforces the notion that the scholarship could be better targeted and specifically toward students whose level of prior achievement is sufficient to benefit from secondary school. It also emphasizes that a policy improving school readiness earlier, combined with ability and means-tested financial aid, would be much more effective in improving school outcomes. In other words, it seems important to address quality of schooling as well as access.

The rest of the paper is organized as follows. In section II we discuss the Mexican context and describe the intervention. In particular, in section II.A we discuss the upper secondary school, or high school, system in Mexico, and in section II.B we describe the scholarship program, including the trends in number of beneficiaries. In section III we describe the evaluation design and the baseline and follow-up data. Section IV presents the main results. Section V presents a discussion of some of the reasons that explain the lack of effects of the intervention. Finally, section VI concludes with the policy implications of the results.

II. Context and Intervention

Mexico, like other middle-income countries, has reached almost universal enrollment rates in primary school (grades 1–6) and lower secondary school

(grades 7–9). However, its education system still faces important challenges, especially in upper secondary school. For instance, about 35 of every 100 students who enroll in upper secondary school will never graduate. Among those who graduated from high school in 2015, more than 60% attained insufficient proficiency levels in math according to the national standardized test, Planea (INEE 2017). Many of the students who drop out or who finish high school but with insufficient skills come from poor or marginalized households. Therefore, upper secondary education dropouts and low achievement levels have important implications for Mexico's long-term economic growth and income disparities (de Hoyos, Rogers, and Székely 2016).

A. Upper Secondary Education in Mexico

The upper secondary education/high school system in Mexico (Educación Media Superior [EMS]) consists of 4.9 million students, typically between 15 and 18 years old, in grades 10–12. We will refer to the upper secondary education system, EMS, as high school from now on to avoid the proliferation of acronyms.

Although graduation rates and learning outcomes in high school have experienced an improvement during the past 10 years, their levels are consistently low (see fig. 1). According to the official statistics from Mexico's National Institute for the Evaluation of Education (Instituto Nacional de Evaluación para la Educación; INEE), in 2014 only 67% of students graduated on time, with this share being significantly higher among females (70%) than males (62%). According to INEE, more than 60% of the cumulative dropouts throughout the 3 years of high school take place during the first year. Household survey data show that enrollment in high school among youths aged 15–18 varies substantially across household income deciles. For instance, according to the information reported by the national household survey Encuesta Nacional de Ingresos y Gastos de los Hogares (ENIGH), in 2012 only 13.5% of youths aged 15–18 in the poorest households were enrolled in high school versus an enrollment rate of 95% for youths aged 15–18 in the richest households. The disparity in enrollment rates across the distribution raises the question whether liquidity constraints have an important role to play. Moreover, information from the 2011 EMS School Dropout Survey shows that more than a third of the 2,549 high school dropouts surveyed declared that economic constraints were the main reason for leaving school (SEP 2012).

The high school system in Mexico is characterized by strict progression criteria. Students must pass five of eight disciplinary subject areas and practical modules. Otherwise they have to repeat the semester. In addition, students

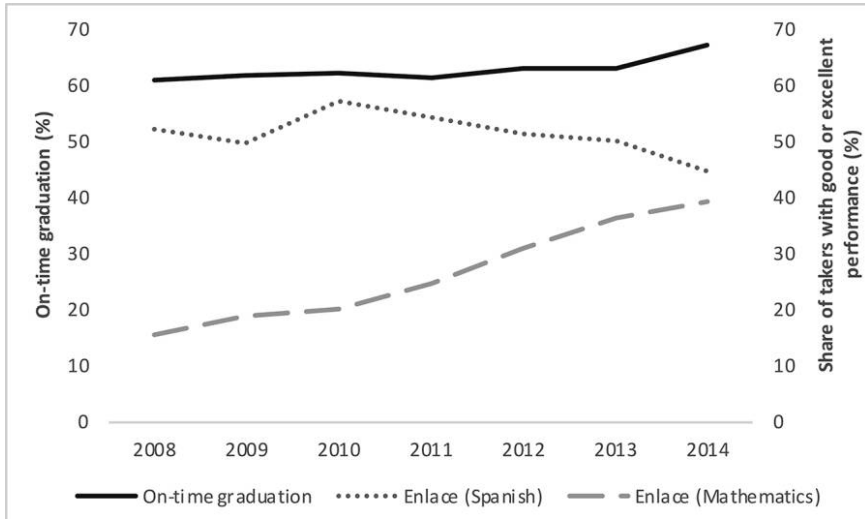

Figure 1. Graduation rates and learning outcomes. Sources: INEE and SEP.

must satisfactorily complete all their subject areas and modules within 10 semesters after enrolling in high school, otherwise they lose the right to reenroll. Partly as a result of the strict promotion rules, there are very high grade and subject repetition rates, 15.3% and 31.3%, respectively, in 2013.[1]

B. The Scholarship Program

In the context of a major high school curricular reform,, in 2007 the Secretariat of Public Education (Secretaría de Educación Pública; SEP) introduced a new scholarship program with the aim of reducing school dropouts and improving learning outcomes.[2] The program targeted poor high school students mostly in urban areas because, at the time, a national conditional cash transfer program, Progresa/Oportunidades (later renamed Prospera), already benefited poor high school students in rural areas.[3] The number of beneficiaries of the scholarship program increased substantially between 2007 and 2014, from less than 300,000 to almost 900,000 (see fig. 2), representing 24% of the total enrollment in high school in Mexico in 2014. The budget assigned to the program in 2014, the year when the scholarship program had the largest number

[1] Students who fail three or more subjects for two consecutive semesters have to repeat the entire grade.

[2] For more information on the high school reform of 2008, see SEP (2008): https://www.gob.mx/sep/documentos/acuerdos-secretariales-que-determinan-la-reforma-integral-de-la-educacion-media-superior-riems.

[3] Back in 2009, the conditional cash transfer program operated in a few urban areas in pilot form, and it later expanded to many urban areas.

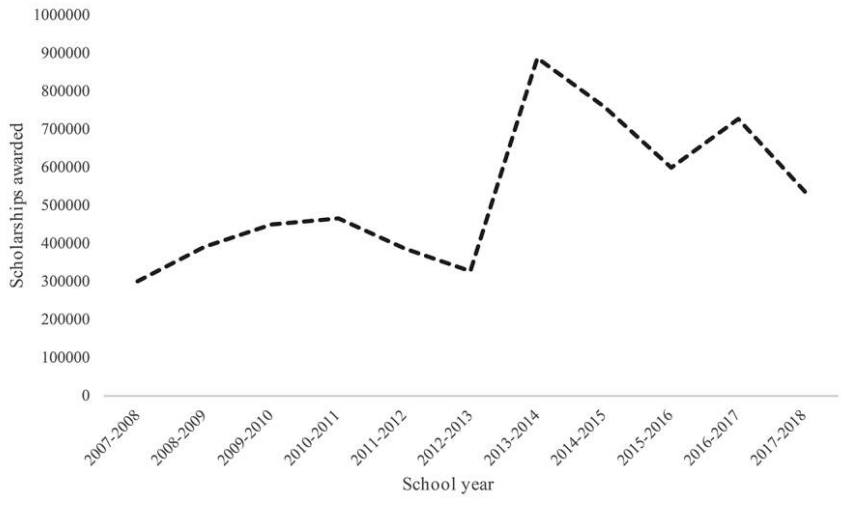

Figure 2. Evolution in the number of scholarship program beneficiaries. Source: SEP.

of beneficiaries, was close to US$410 million, accounting for 23% of the total high school federal budget, excluding salaries.

The scholarship program had three different types of scholarships: "support," "retention," and "excellence." The difference between the three types of scholarships was determined by the grade point average (GPA) during the year prior to applying to the program (the last year of lower secondary in the case of candidates about to enter high school). The "excellence" scholarship required a minimum GPA of 9 out of 10, the "retention"scholarship required a GPA between 8 and 8.9, and the "support" scholarship required a minimum GPA of 6 (the passing mark). To incentivize students' efforts, monthly transfers were larger under the "excellence" modality than under the "retention" modality, and monthly transfers under the "retention" modality were larger than those under the "support" modality. Transfers also varied between gender, grade, and type of degree program. Table 1 shows the monthly transfers in 2009 under the different scholarship modalities by grades and gender. The overall average monthly value of the scholarship was 716 MXN (or 56 USD in 2009), slightly less than the extreme poverty line of that same year.[4]

[4] In 2009, the National Council for the Evaluation of Social Development Policy (Consejo Nacional de Evaluación de la Política de Desarrollo Social; CONEVAL) defined three poverty lines in Mexico: "food intake" (*pobreza alimentaria*) or extreme poverty line, "capabilities" (*pobreza de capacidades*), and "assets" (*pobreza patrimonial*), with values of 949 MXN, 1,164 MXN, and 1,905 MXN per person per month, respectively.

TABLE 1
MONTHLY TRANSFERS BY TYPE OF SCHOLARSHIP

Scholarship Type, Grade	Man	Woman
Support (GPA 6.0–7.9):		
1o	500	525
2o	525	575
3o and 4o	575	625
Retention (GPA 8.0–8.9):		
1o	650	700
2o	700	750
3o and 4o	750	790
Excellence:		
ME1 (GPA 9.0–9.4)	850	900
ME2 (GPA 9.5–9.7)	900	950
ME3 (GPA 9.8–10)	950	1,000

Note. All amounts expressed in Mexican pesos (MXN) of 2009 (13 MXN to 1 USD at the time). 1o = first year of high school; 2o = second year of high school; 3o = third year of high school; 4o = fourth year of high school; ME1 = excellence modality 1; ME2 = excellence modality 2; ME3 = excellence modality 3.

The scholarship program's operating rules of 2009, the year when the randomization took place, defined the following eligibility criteria for students to be considered as potential beneficiaries:

1. Applicants should be enrolled in a public high school.
2. Applicants who were about to enter high school were required to present their lower secondary school graduation certificate. Students continuing high school studies were required to have a passing mark in all subject areas of the previous semester.
3. Applicants should not be enrolled in any other government program providing scholarships.
4. Applicants should have a household per capita income below the "assets" poverty line defined by CONEVAL as 1,413 MXN and 2,102 MXN per person per month for households located in rural and urban areas, respectively.
5. Applicants should apply for a scholarship through the program's portal.[5]

To assign the scholarships, SEP issued one and sometimes two calls for applications per year depending on budget availability. The call for applications was usually issued in March of each year, targeting students starting or continuing high school in the following academic year (August). Interested candidates started their application process by completing an online form that captured household income, the availability of household assets, parents' education, and basic academic information such as the school and grade of enrollment.

[5] El Programa de Becas Elisa Acuña, https://www.becasmediasuperior.sep.gob.mx.

All applicants were required to have a personal identifier known as the CURP issued by the government of Mexico.[6] SEP used the CURP to identify applicants who were beneficiaries of the conditional cash transfer program (Progresa/Oportunidades) at the time of applying, which automatically excluded them from the scholarship program. For instance, of the close to 70,000 applicants that responded to the call for applications in March of 2009, more than 10,000 were not eligible because they were already part of the Oportunidades program.

The self-declared household income and assets information included in the online application form is used to rank students in terms of their likelihood of being below the "assets" poverty line. Finally, as stated by the call for applications, SEP gives priority to first-year high school students. The likelihood of being poor, budget availability, and high school grade of enrollment determined a list of preselected candidates.

When a candidate was preselected—usually 1 month after the call for applications closed—he or she was notified by email and received instructions on how to complete the application process. The next step was to enroll in high school or continue to the second or third year of high school and present to the school all the relevant documentation to validate the information uploaded in the program's portal. School directors received the list of preselected candidates via email from SEP and were responsible for validating the information provided by the candidates. In particular, the school director had to validate that the student was enrolled in his or her school, that the student had no subject areas of previous semesters below the passing mark, and had to validate the GPA as declared by the student. Once the school director validated the information, the candidates receive a second email notifying them that they had been awarded a scholarship. SEP issued debit cards under the name of the beneficiary. As a final step, the student, together with his or her father, mother, or legal guardian, collected the debit card at the closest branch of the commercial bank participating in the program.

III. Evaluation Design

Our evaluation strategy relies on random assignment into the program. The call for applications of March 2009 received close to 70,000 applications of which more than 50,000 students fulfilled the eligibility criteria. However, SEP's budget was enough for awarding between 40,000 and 45,000 scholarships, depending on the distribution by type of scholarship. Thus, for the purposes of evaluation,

[6] Mexican citizens have a unique personal identifier, known as the Unique Population Registry Code (Clave Única de Registro Poblacional; CURP) formed by an algorithm combining name, surname, date of birth, sex, state of birth, plus two randomly generated digits. The scholarship application portal was linked with Registro Nacional de Población (RENAPO), the area of the Mexican government administering the CURP, to minimize mistakes while entering the information.

SEP authorized a randomized assignment of the scholarship in a preselected eligible population of 12,000 students: 6,000 students were randomly selected from the pool of 50,000 eligible students to be part of the treatment group, and the same number of students formed the control group. All 12,000 students received an email from SEP at the end of April 2009 notifying them that they were granted or rejected for a scholarship according to the random assignment.

Because the scholarship program prioritized first-year high school students, 60% of the eligible candidates were completing lower secondary school (ninth grade) when submitting their application in March 2009. Therefore, 3,648 students in the treatment group and 3,673 students in the control group were about to start high school in August 2009. For the purposes of this paper, we will concentrate on this subsample, although for completeness we will also show the results of the scholarship on the education outcomes of second- and third-year high school students. Focusing on first-year students and following them through the three school years of high school estimates the effect on graduation rates and learning outcomes, measured by the standardized test Evaluacion Nacional de Logro Academico en Centros Escolares (ENLACE) for twelfth grade, of 1 year of exposure to the program at the beginning of high school versus not having this monetary support.

Because the scholarship is assigned on an annual basis, randomization itself could exclude an applicant for only one school year. Thus, all students, treatments and controls, could apply to receive a scholarship in the following call for applications in March 2010. Table 2 shows the evolution of scholarship holders over the 3 years of high school and distinguishes between treatment and control. Of the 3,648 first-year high school students originally selected to be part of the treatment, 2,533 finalized the validation process and received the scholarship during their first year. Of those, 80% (2,043) continue getting the scholarship the following academic year; and of those, 83% (1,591) received the scholarship during the third and final year.

Figure 3 presents a timeline of the evaluation design. The key dates during school year 2008–9 were the call for applications, randomization, notification of

TABLE 2
EVOLUTION OF SCHOLARSHIP HOLDERS OVER THEIR HIGH SCHOOL TRAJECTORY

	First-Year Sample (1)	Scholarship Year 1 (2)	Scholarship Year 2 (3)	Scholarship Year 3 (4)
Treatment	3,648	2,533	2,043	1,591
Control	3,673	0	851	967

Note. For the "Treatment" row, cols. 3 and 4 correspond to the number of students getting the scholarship in years 2 and 3, respectively, conditional on having received it during the first year. For the "Control" row, cols. 3 and 4 correspond to the number of students receiving the scholarship in years 2 and 3, respectively, conditional on not receiving it the first year.

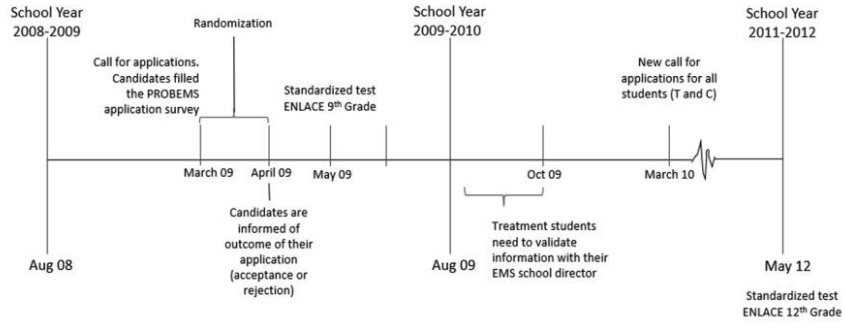

Figure 3. Timeline of the PROBEMS impact-evaluation strategy. T = treatment; C = control. Source: Based on INEE, SEP, and evaluation schedule.

the results to candidates from March to April 2009, and the national standardized test ENLACE for ninth grade in May 2009. In March 2010, all students could reapply for a scholarship, including those who were part of the control group. Hence the experimental variation consisted of a random offer of funding (or not) for one year of high school (grade 10 for students entering high school in 2009). The national standardized test ENLACE for twelfth grade was applied in May 2012 to all students finishing high school in Mexico. So we merge the baseline data with the twelfth-grade ENLACE of May 2012 as a proxy for high school graduation.[7] We also merge our baseline data with the twelfth-grade ENLACE of 2013 to identify lagging students that nevertheless graduated from high school. These are the administrative data used to measure the outcome variables: high school graduation rates and math and Spanish test scores.

A. Evaluation Data

We use two sources to measure students' characteristics at baseline. First, we rely on the information provided by all applicants in March 2009 through the scholarship program portal. This survey included self-reported information on household income, education of parents, number of family members living in the same household, the availability of household assets, as well as gender, age, geographic location, and GPA of the applicant, among others.

Second, to measure students' ability at baseline, we use the information from the census-based ninth-grade ENLACE measuring math and language achievement levels. From 2007 to 2013, ENLACE was administered to all students in third to ninth grades and those finishing twelfth grade. The test had no consequences either on graduation or on a student's GPA. ENLACE uses the CURP to identify all test takers.

[7] We briefly discuss the reliability of this proxy further below.

Using the CURP, we were able to merge the baseline information of each applicant (provided through the program's portal during the application process) with the micro data from the ninth-grade ENLACE that was taken by applicants in May 2009. Scholarship candidates identified in the ninth-grade ENLACE of 2009 were classified as first-year high school students. Table 3 shows the baseline characteristics and distinguishes between students in the treatment and in the control groups. In panel A are reported the socioeconomic characteristics at baseline as declared by applicants through the program's portal, and in panel B the administrative information on ninth-grade test scores is presented. Overall, the characteristics of the treatment and control groups are well balanced in line with the randomized design of the evaluation.

Outcome variables are measured through the twelfth-grade ENLACE administered in May 2012 for all students finishing high school. Additionally, our evaluation sample was also merged with the twelfth-grade ENLACE of 2013 to identify students that graduated from high school but that had a lag of 1 year. The participation of first-year high school students in our sample in the twelfth-grade ENLACE of 2012 or 2013 is used as a proxy for upper

TABLE 3
BASELINE CHARACTERISTICS BY TREATMENT STATUS

	Treatment		Control		
	Mean	SD	Mean	SD	T = C (*p*-Value)
	A. Household and Location				
Mud floors[a]	.04	.19	.04	.19	.86
Refrigerator	.91	.29	.91	.29	.79
Piped water	.92	.27	.93	.26	.54
Piped water inside	.82	.38	.82	.38	.99
Toilet exclusive for the household	.82	.39	.83	.37	.10
Piped water toilet	.77	.42	.77	.42	.79
Electricity	.98	.15	.97	.17	.20
Blender	.87	.34	.87	.33	.60
Gas stove	.93	.25	.93	.25	.79
Radio	.57	.49	.56	.50	.49
Time to school (hours)	.17	.81	.17	.81	.97
Expenditure transportation to school	54.69	63.63	53.19	61.97	.31
Urban	.46	.50	.46	.50	.99
	B. Other Characteristics				
Income	634.79	496.06	631.09	490.81	.75
Age[b]	15.26	.44	15.27	.44	.39
Male[b]	.55	.50	.56	.50	.40
Spanish score ENLACE 2009	.01	1.01	−.01	.99	.30
Math score ENLACE 2009	.01	1.01	−.01	.99	.50

Note. $N = 7{,}321$. "Income" is self-declared, personal monthly income in Mexican pesos of 2009. T = treatment; C = control.
[a] $N = 7{,}320$.
[b] $N = 7{,}220$.

secondary graduation.[8] Despite its lack of consequences, the twelfth-grade ENLACE tested more than 90% of the students graduating from high school in Mexico, making it a reliable proxy for graduation. For a discussion on the reliability of this measure as a proxy for high school graduation, see Dustan, de Janvry, and Sadoulet (2017), Avitabile and de Hoyos (2018), and de Hoyos, Estrada, and Vargas (2021). The same end-of-secondary-school test is also used to measure the effect of the scholarship program on math and Spanish test scores.

B. Empirical Strategy

To estimate the causal effect of providing a scholarship to first-year high school students on education outcomes, we estimate the following equation:

$$Y_i = \beta_0 + \beta_1 D_i + \boldsymbol{\gamma}' \mathbf{X}_i + u_i, \tag{1}$$

where Y_i is either an indicator that the student participated in the final exam (ENLACE in twelfth grade) or his or her test score recorded in ENLACE; D_i is an indicator dummy that takes the value of 1 if student i is assigned to the treatment group, and 0 otherwise; β_1 measures the intention-to-treat effect of the scholarship on education outcomes; and $\mathbf{X}_i$ is a vector of baseline covariates measured at the individual level and includes age and gender of the student, math and Spanish test scores in the ninth-grade ENLACE, a dummy controlling for rural areas of the school where the student attended ninth grade, regional dummies, and self-declared household income and the availability of household assets.

We standardize all test scores by using the mean and the standard deviation observed in the control group. In order to address the inference issues related to the presence of multiple outcomes, we consider the effect on a composite score defined by the simple average of the standardized scores in math and Spanish. When we consider multiple separate hypotheses, we compute step-down p-values that correct for multiple hypothesis testing on the basis of the method by Romano and Wolf (2005).

IV. Results

Education Outcomes.—The main results are summarized in table 4. We present the effects of the scholarship program on four education outcomes: high school graduation (proxied by students present in the twelfth-grade ENLACE),

[8] When we refer to ENLACE twelfth grade, we include information for the tests administered in 2012 and 2013. Of the total 7,321 students in our evaluation sample, 4,978 were identified in the twelfth-grade ENLACE of 2012, a proxy for on-time graduation. An additional 262 students were identified in the twelfth-grade ENLACE of 2013; these students also graduated but with a lag of 1 year. So most of the effects on outcome "graduation" are, indeed, on-time graduation.

TABLE 4
EFFECT OF SCHOLARSHIP PROGRAM ON HIGH SCHOOL EDUCATION OUTCOMES

	ENLACE (Y/N)		Math		Spanish		Average	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treatment	.012	.008	.006	−.016	.018	−.004	.012	−.010
	(.011)	(.011)	(.029)	(.023)	(.028)	(.023)	(.026)	(.026)
RW *p*-value	.68	.90	.91	.90	.91	.90	.91	.90
Controls		Yes		Yes		Yes		Yes
Observations	7,321	7,220	5,050	4,988	5,050	4,988	5,050	4,988
Mean dependent control group	.68	.69	.07	.07	−.03	−.03	.02	.02
SD dependent control group	.47	.46	1.00	1.00	.98	.99	.90	.90

Note. Romano-Wolf (RW) step-down *p*-values for two groups of coefficients. Columns 1, 3, 5, and 7 present estimations with no controls, and cols. 2, 4, 6, and 8 present estimations including controls. The full set of controls includes age, dummies for sex and area (urban-rural), and test scores on the ninth-grade ENLACE, one for Spanish and the other for math. ENLACE (Y/N) takes the value of 1 if the student took the twelfth-grade exam in 2012, and 0 otherwise. Math and Spanish refer to the ENLACE score in 2012. Average refers to the average of Spanish and math scores in 2012. Standard errors are in parentheses.

math test scores, Spanish test scores, and a simple average of math and Spanish scores. We ran two specifications for each of these four outcomes, one without controls and a second one including the controls as defined above. Regardless of the specification, we do not find statistically significant effects of scholarships on any of the four education outcomes. All the effects are very small and not statistically different from zero, even though our sample is large enough to detect small effects. Indeed, the 95% confidence intervals do not include large effects. For example, the top part of the confidence interval for the graduation rate, proxied by taking the ENLACE exam, is 3.4 percentage points, while the top part of the confidence interval for Spanish (with no controls) is 7.3% of a standard deviation. These are all small effects, precisely estimated, and a puzzle that we turn to below to offer some explanations.

Before we move on, it is important to note that the effect of the scholarship on test scores is estimated on the subsample of children who attended high school and participated in the exam process. This is an endogenously selected subsample. In principle, this could bias the results of the effect of the scholarship on test scores because of the potential composition differences (in relevant unobservable dimensions) between the treated and nontreated samples. However, the program had no effect on high school participation. Attanasio, Kugler, and Meghir (2011) point out that under these circumstances, there will be no bias in the treatment-control comparison so long as the treatment, as well as having no effect on participation, did not alter the composition of those attending high school.

Heterogeneity.—We now consider whether the overall results showing no statistical effects mask significant effects in subgroups. By using step-down *p*-values

adjusted for multiple testing, we avoid the pitfalls of data mining that could lead us to false positives from such an analysis.

Tables A1 and A2 in the appendix show the effects of the scholarship on graduation rates by age, rural versus urban (measured by the location of the lower secondary school of the applicants), gender, and geographic region. The scholarships did not increase either girls' or boys' probability of graduating. It also did not have any effect among students enrolled in rural or urban lower secondary schools at the time of applying to the scholarship. The only effect that is marginally significant (p-value = .06) is among slightly older candidates, those who were 16 years old at the time of applying for the scholarship. In this population subgroup of students—who have a significantly lower probability of graduating compared with younger students—the scholarship program is increasing the probability of graduation by 4 percentage points on a mean graduation rate of 62%. Table A2 presents the effects by geographic region and shows zero effect of the scholarship in the five regions defined. Although not presented here, the lack of statistically significant effects on graduation rates by age, area, sex, and region hold for math and Spanish test scores.

Although the focus of the paper is on first-year high school students at the moment of randomization (March 2009), we also tested the effect of the scholarship on education outcomes among students that were already in the second or third year of high school. As it was the case for first-year students in the experimental sample, treatment and control samples were balanced at baseline for second- and third-year students. The results, available upon request, show no effect of the scholarship on graduation rates or test scores among second- and third-year high school students.

V. Why Was the Scholarship Program Ineffective?

Before we move to further explanations, it is important to remember that the scholarship promise for the lottery winners was only for 1 year and that in subsequent years anyone could apply and would be selected without randomization, subject to the overall available budget and the eligibility criteria. This allows members of the original control group to obtain a scholarship in subsequent years as discussed in section III. While we always use the original randomization as the treatment indicator, this feature will have an attenuating effect: students from the control group may have attended in the first year without funding in anticipation of a possible future scholarship. And moreover, some students who would have attended if the scholarship was promised for all of high school may not have done so with the promise of just 1 year. This would be particularly true if the value of high school lies in completing it rather than in individual years of attendance. Both these issues could attenuate the

effect of the policy relative to a policy that promised full funding for the entire high school period.

Beyond this point, the other questions that arise are about targeting by wealth and school readiness. In this section, we perform further analysis to identify the effects of these potential explanations behind the lack of effect of the scholarship program. To test for heterogeneous effects by socioeconomic status, we use information from the application portal to compute an index of self-declared household assets. The index of household assets (IHA) is the sum of four variables, indicating, respectively, the following basic characteristics of the dwelling: (1) concrete floors, (2) running water inside the house, (3) toilets connected to sewerage, and (4) concrete roof. A 0 is used to indicate the absence of the amenity and a 1 its presence. The IHA index, therefore, has a maximum value of 4 and minimum of 0. The distribution of the IHA is shown in figure 4. Few students self-declared that they live in a household with zero or only one of the basic dwelling characteristics; close to 70% of students have only two or three of the basic needs met, and 23% of students in our sample declared living in a household that meets all four basic needs.

The evaluation sample was divided in two groups according to the value of the IHA: those with an IHA value of 2 or less, and the rest. Table 5 shows the effects of the scholarship program on graduation rates by socioeconomic status in a specification with and without controls. The effects of the scholarship program are zero, even within the group of more marginalized individuals (IHA of 2 or below). To complement these results, we exploit the ninth-grade

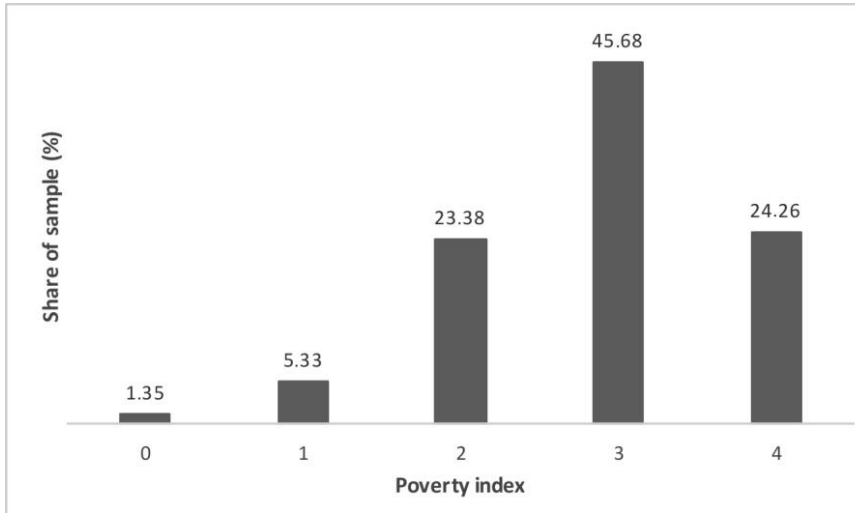

Figure 4. Share of students in the different categories of the IHA. Source: Authors' calculations based on self-reported information.

TABLE 5
EFFECT OF SCHOLARSHIP PROGRAM ON HIGH SCHOOL GRADUATION BY LEVEL OF HOUSEHOLD ASSETS

	ENLACE (Y/N)			
	IHA (0–2)		IHA (3 or 4)	
	(1)	(2)	(3)	(4)
Treatment	.006	.005	.015	.010
	(.020)	(.020)	(.013)	(.013)
Controls		Yes		Yes
Observations	2,201	2,176	5,120	5,044
Mean dependent control group	.67	.68	.69	.69
SD dependent control group	.47	.47	.46	.46

Note. The full set of controls includes age, dummies for sex and area (urban-rural), and test scores on the ninth-grade ENLACE, one for Spanish and the other for math. ENLACE (Y/N) takes the value of 1 if the student took the twelfth-grade exam, and 0 otherwise. The IHA takes a value from 0 to 4 depending on whether the student's household has a cement roof, cement floor, piped water, and piped water toilet, respectively. Standard errors are in parentheses.

ENLACE context questionnaire, which reports on the availability of the following dwelling characteristics or household assets: concrete floors, refrigerator, running water, gas stove, radio, among others. We estimate the effect of the scholarship on education outcomes among students in households with and without these characteristics.[9] These additional results, available upon request, show that the scholarship had no significant effects on education outcomes among students in households with and without these assets.

A. Targeting

To identify how well targeted our scholarship program was, we use the Mexican national household survey ENIGH, which measures incomes and expenditures, to identify self-declared scholarship holders and divide them between beneficiaries of the conditional cash transfer program Oportunidades and "other program from the Federal Government."[10] Using this survey for 2010, we identify households that have students enrolled in high school and, among this subsample, those that declared having an Oportunidades scholarship or a scholarship from another program of the federal government.[11] Figure 5 shows the share of scholarship beneficiaries by decile of the distribution of per capita household income. Overall, Oportunidades scholarships seem to be well targeted, benefiting the poorest high school students. However, beneficiaries of "other government program," a category basically capturing the scholarship

[9] ENLACE's context questionnaire is applied only to a sample of students, therefore these estimations rely on only 564 observations divided among the treatment and control groups.
[10] Oportunidades was formerly know as Progresa.
[11] ENIGH is collected every 2 years, and there was no survey in 2009, the year when the scholarship program applicants provided the socioeconomic information through the online format.

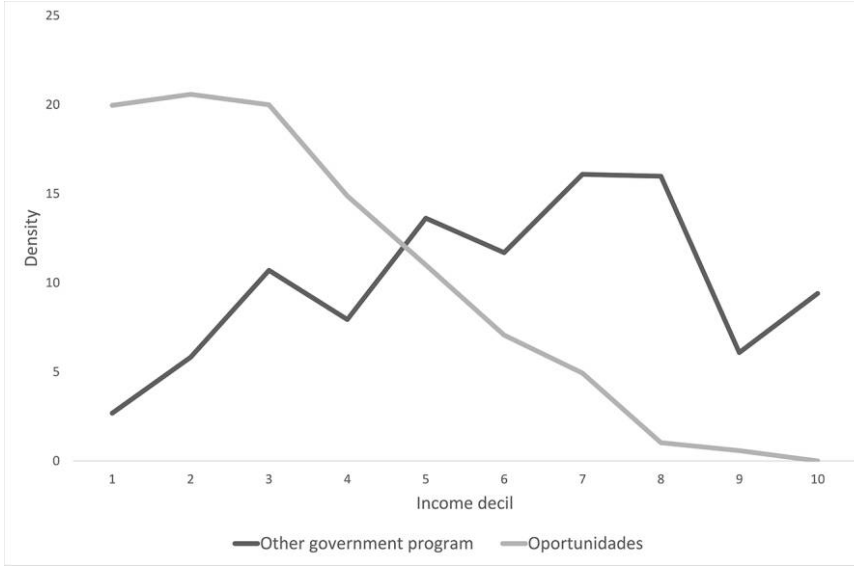

Figure 5. Receipt of alternative scholarships across the income distribution: Oportunidades versus "other government program." Source: Authors' calculations based on ENIGH 2010.

program we are considering, tend to be located in deciles 5–9 of the income distribution. This evidence shows that the program's targeting mechanism was not very effective in reaching the poorest or they were already covered by the conditional cash transfer program (Oportunidades). The poor targeting is not surprising given the large share of poor students already covered by Oportunidades and the fact that the application for the scholarship program was done online.

B. Academic Readiness

We now consider the role of school readiness and whether this can explain the lack of effect. Academic readiness is measured by the proficiency level at the end of lower secondary school (grade 9). We use, separately, math and Spanish results of the ninth-grade ENLACE of 2009—the year when the candidates applied for a scholarship—to divide our sample in terciles of the distribution of test scores. Because in 2009 65% of the students in our sample got an insufficient proficiency level in math according to the ninth-grade ENLACE, the top tercile corresponds, almost precisely, to those above the insufficient level, or with academic readiness. We ran two specifications within each of the terciles of the ninth-grade ENLACE, with and without controls, to measure the effects of the scholarship on the probability of graduating and on test scores at the end of high school. The effects of the scholarship program on the

probability of graduation, by tercile of the ninth-grade math distribution, are summarized in table 6.

The results show positive and statistically significant effects (adjusted *p*-value of 5%) of the scholarship on the probability of graduation among those candidates in the top tercile of the ninth-grade math test scores distribution (i.e., those with academic readiness). The inclusion of controls does not change the results. Although significant, the effect is still quite small: for students with academic readiness, receiving a scholarship increases their probability of graduation by 4 percentage points (of a mean level of 76% among the control group). We found no effects within the lowest and middle terciles of the ninth-grade test scores distribution. There are also no effects of the scholarships on learning outcomes by tercile of ninth-grade math or Spanish test scores.

Students with academic readiness (i.e., those in the top tercile of the ninth-grade math test scores) have the largest probability of finishing high school (76%) as compared with those in the bottom tercile (57%). It seems that the scholarship can be marginally effective for those with sufficiently strong prior achievement, pointing to the need for interventions that improve outcomes earlier on. This is consistent with other school interventions that seem to build on prior success (Machin, McNally, and Meghir 2010).

In table A3, we cross academic readiness with socioeconomic status measured by the IHA. We found a positive effect of the scholarship program on high school graduation rates among students who had academic readiness both in households with relatively "high" and "low" socioeconomic status (IHA

TABLE 6
EFFECT ON HIGH SCHOOL GRADUATION BY PERFORMANCE IN ENLACE 2009 (MATH)

	ENLACE (Y/N)					
	Lowest Tercile		Middle Tercile		Highest Tercile	
	(1)	(2)	(3)	(4)	(5)	(6)
Treatment	.004	−.003	−.004	−.005	.040**	.037*
	(.020)	(.020)	(.018)	(.018)	(.017)	(.017)
RW *p*-value	.97	.95	.97	.95	.05	.08
Controls		Yes		Yes		Yes
Observations	2,486	2,452	2,449	2,418	2,386	2,350
Mean dependent control group	.57	.58	.72	.72	.76	.76
SD dependent control group	.49	.49	.45	.45	.43	.43

Note. RW step-down *p*-values for two groups of coefficients. Columns 1, 3, 5 present estimations with no controls, and cols. 2, 4, and 6 present estimations including controls. The full set of controls includes age, dummies for sex and area (urban-rural), and test scores on the ninth-grade ENLACE, one for Spanish and the other for math. ENLACE (Y/N) takes the value of 1 if the student took the twelfth-grade exam, and 0 otherwise. The three groups are formed using the terciles of performance in ENLACE math 2009. Standard errors are in parentheses.

* $p < .10$.

** $p < .05$.

below or equal to 2), but this effect was marginally significant only for relatively well-off households. In the appendix, we also consider whether baseline student motivation makes a difference to the effect of the program, but we again find no effect.[12]

C. *Interpretation*

The results presented here are consistent with other evidence on the effects of scholarships and conditional cash transfers in high school education outcomes in Mexico. The most recent evidence identifies the importance of targeting to make scholarships effective. For instance, both Parker and Vogl (2018) and Araujo et al. (2018), relying on a difference-in-differences estimator, show that young children exposed to Progresa/Oportunidades, a well-targeted conditional cash transfer program, increase the likelihood of graduating from high school. However, when the cash transfer is not well targeted, it has no effects on high school graduation rates, as shown by Dustan (2020) in an evaluation of "Prepa Si," a universal scholarship program for high school students in Mexico City. Dustan (2020) also finds that Prepa Si had no effect on test scores measured by ENLACE at the end of upper secondary school. The evidence here is consistent with these earlier results.

An important explanation for the absence of effects of the scholarship program is the large share of first-year high school students without academic readiness. Two out of three eligible candidates for a scholarship declare that income is not the binding constraint for attending high school, and the results suggest that the monetary incentive is not strong enough to affect their decision. For the majority of first-year high school students, the real problem lies in the profound academic deficiencies that students carry over from basic education.

Finally, as we mentioned earlier, the program did not guarantee funding for the entire period of high school. Moreover, randomly excluded individuals could reapply the following year if they were attending high school. Thus the intervention should best be interpreted as the effect of 1 year of funding, with the possibility (but not the certainty) of being offered a scholarship later, whether originally in the treatment or the control group. Nevertheless, the incentive generated by the program among the lower-income individuals should have been strong enough to observe an effect if it had been targeted well enough and students were prepared adequately for such further study.

[12] Students with academic readiness were also more likely to get a high monthly transfer through the "excellence" scholarship modality. We did not have access to the type of scholarship granted to each student. Therefore, we cannot fully rule out the possibility that the significant effects shown among students with academic readiness could be explained, at least partly, by a larger transfer.

VI. Conclusions

In this paper, we present evidence of the effect of a randomized scholarship program aimed at low-income students with the intention of improving high school graduation rates and test scores. The results we obtain show that, in essence, the program was ineffective.

We explore this negative result in detail to understand the reasons behind it. We show that the program was not effectively targeted, because students from poor households were a minority among its beneficiaries. The only positive effect we find is among students with sufficient academic readiness, that is, those students who finish lower secondary school with a proficiency level above insufficient.

These results are important because they demonstrate not only the importance of targeting but also the need for improving the quality of education at lower levels of schooling. Only then can one hope to improve the educational outcomes of poor students by increasing graduation and learning at the high school level. Interventions aimed at improving the demand for upper secondary school should be complemented and preceded by interventions aimed at improving foundational skills of poor students to expand educational opportunity during adolescence.

Appendix

Motivation

A random sample of around 10% of the ENLACE takers were administered a survey that elicits a broad set of information about student sociodemographic characteristics, such as student effort, family composition, and aspirations. We merge the information of this survey applied to students in our evaluation sample to test whether motivation affects the treatment effect.

The merged sample includes only 564 individuals, a sample substantially smaller than our original one but still well balanced between treatment and control and showing the same lack of treatment effects as with the entire sample. Students' motivation is proxied by the self-declared highest degree they expected to achieve, the options being lower secondary school, high school, technical higher education, university, or postgraduate. Of the students in our sample, 80% expected to finish, at least, a university degree, and 47% expected to get a postgraduate degree. We classify these two groups as "motivated students" and "highly motivated students," respectively.

Table A4 shows the results of a specification including, separately, our two definitions of motivation on high school graduation and test scores. As expected, motivated and highly motivated students have a higher probability of graduating and better test scores at the end of high school. However, the treatment effect of

the scholarship program on graduation and test scores remains zero in these new specifications, and the interaction between the treatment and motivation is not statistically significant. In other words, even among motivated and highly motivated students, the scholarship is not relevant for increasing their likelihood of finishing high school or obtaining better grades. The results remain when we use the self-declared hours spent doing homework (from the ENLACE context questionnaire) as an alternative proxy for "motivated students."

TABLE A1

HETEROGENEOUS EFFECT OF SCHOLARSHIP PROGRAM ON HIGH SCHOOL GRADUATION

	ENLACE (Y/N)					
	Age		Area		Sex	
	15 Years (1)	16 Years (2)	Rural (3)	Urban (4)	Male (5)	Female (6)
Treatment	−.001	.041	.017	.007	−.000	.019
	(.012)	(.022)	(.015)	(.015)	(.017)	(.014)
RW *p*-value	.99	.26	.60	.95	.99	.52
Observations	5,308	1,912	3,962	3,359	3,213	4,007
Mean dependent control group	.71	.62	.66	.72	.68	.69
SD dependent control group	.45	.48	.48	.45	.47	.46

Note. RW *p*-values for all coefficients. ENLACE (Y/N) takes the value of 1 if the student took the twelfth-grade exam, and 0 otherwise. Standard errors are in parentheses.

TABLE A2

EFFECT OF SCHOLARSHIP PROGRAM ON HIGH SCHOOL GRADUATION, BY REGION

	ENLACE (Y/N)				
	Northwest (1)	Northeast (2)	West (3)	Center (4)	Southeast (5)
Treatment	.002	.024	.030	−.008	.004
	(.028)	(.020)	(.024)	(.026)	(.024)
Observations	1,096	2,077	1,586	1,291	1,271
Mean dependent control group	.70	.69	.61	.68	.75
SD dependent control group	.46	.46	.49	.47	.43

Note. ENLACE (Y/N) takes the value of 1 if the student took the twelfth-grade exam, and 0 otherwise. Northwest includes Baja California, Baja California Sur, Chihuahua, Sinaloa, and Sonora; Northeast includes Coahuila, Durango, Nuevo León, San Luís Potosí, and Tamaulipas; West includes Aguascalientes, Colima, Guanajuato, Jalisco, Michoacán, Nayarit, Queretaro, and Zacatecas; Center includes Ciudad de México, Guerrero, Hidalgo, México, Morelos, Puebla, and Tlaxcala; Southeast includes Campeche, Chiapas, Oaxaca, Quinatan Roo, Tabasco, Veracruz, and Yucatán. Standard errors are in parentheses.

TABLE A3
EFFECT BY ACADEMIC READINESS AND SOCIOECONOMIC STATUS

	ENLACE (Y/N)					
	"High" Socioeconomic Status			"Low" Socioeconomic Status		
	Highest Tercile (1)	Middle Tercile (2)	Lowest Tercile (3)	Highest Tercile (4)	Middle Tercile (5)	Lowest Tercile (6)
Treatment	.038	.003	.007	.036	−.047	.030
	(.019)	(.022)	(.024)	(.032)	(.034)	(.034)
RW *p*-value	.12	.99	.99	.50	.75	.78
Observations	1,727	1,666	1,727	661	703	837

Note. RW *p*-values for two groups of coefficients, cols. 1–3 and cols. 4–6. ENLACE (Y/N) takes the value of 1 if the student took the twelfth-grade exam, and 0 otherwise. The three groups are formed by using the terciles of performance in ENLACE math 2009. "Low" socioeconomic status is households with an IHA of 0, 1, or 2. "High" socioeconomics status is households with an IHA of 3 or 4. Standard errors are in parentheses.

TABLE A4
HETEROGENEOUS EFFECT BY MOTIVATION

	ENLACE (Y/N) (1)	Math (2)	Spanish (3)	ENLACE (Y/N) (4)	Math (5)	Spanish (6)
Motivated (M)	.127**	.345**	.331**			
	(.054)	(.134)	(.141)			
Highly motivated (HM)				.210***	.530***	.346;*
				(.065)	(.180)	(.192)
Treatment × Motivation	−.019	.045	−.035	.001	.063	−.058
	(.075)	(.185)	(.196)	(.093)	(.257)	(.274)
Treatment	.013	.141	.025	−.006	.084	.037
	(.052)	(.133)	(.141)	(.083)	(.237)	(.253)
RW *p*-value	.96	.63	.96	.98	.97	.98
Observations	564	410	410	564	410	410

Note. RW *p*-values for two groups of coefficients, cols. 1–3 and cols. 4–6. Standard errors are in parentheses.
* $p < .10$.
** $p < .05$.
*** $p < .01$.

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