WPS7427

High School Track Choice and Financial Constraints

Evidence from Urban Mexico

Ciro Avitabile
Matteo Bobba
Marco Pariguana

WORLD BANK GROUP

Abstract

Parents and students from different socioeconomic backgrounds value differently school characteristics, but the reasons behind this preference heterogeneity are not well understood. In the context of the centralized school assignment system in Mexico City, this study analyzes how a large household income shock affects choices over high school tracks exploiting the discontinuity in the assignment of the welfare program *Oportunidades*. The income shock significantly increases the probability of choosing the vocational track vis-a-vis the other more academic-oriented tracks. The findings suggest that the transfer relaxes the financial constraints that prevent relatively low-ability students from choosing the schooling option with higher labor market returns.

High School Track Choice and Financial Constraints:

Evidence From Urban Mexico

Ciro Avitabile[*]   Matteo Bobba[†]   Marco Pariguana[‡]

_____

[*]The World Bank. E-mail: cavitabile@worlbank.org.
[†]Toulouse School of Economics. E-mail: matteo.bobba@gmail.com.
[‡]Pennsylvania State University. E-mail: map535@psu.edu.

1   Introduction

Differences in socioeconomic status are associated with significant variation in the weights that parents and students place on important school characteristics - e.g. quality of peers, distance, ethnic composition [Hastings et al., 2008; Burgess et al., 2009]. Nevertheless it is unclear to what extent these disparate valuations are the result of financial constraints or reflect differences in unobserved characteristics, such as the level of information, social norms and idiosyncratic tastes.[1] This paper studies how a large household income shock can affect stated preferences over high school tracks of relatively disadvantaged youths living in a suburban district of Mexico City.[2]

School track choice can have important consequences on future academic trajectories and labor market outcomes [Dustmann et al., 2014; Kerr et al., 2013]. Countries differ widely on the degree to which they track students, and the age at which students begin to be tracked.[3] Within-school ability grouping is common in the United States and Canada, while curricular tracking at the secondary level is widespread in many countries (see continental Europe and Latin America). Mexico is a particularly interesting context to study high school track choices. When completing middle school, students can choose among three different education modalities (*general*, *technical* and *vocational*), that greatly differ in the extent to which they prepare students to enter the labor market. Only 9% of high school students enroll in the vocational track - this is extremely low not only compared to the OECD average (44%), but also to other countries in Latin America (see Table 1). Only six out of ten students who enroll in upper secondary education successfully graduate, and graduation rates vary across high school tracks with general schools featuring the highest (64%), followed by technical schools (61%) and vocational schools (48%) (Ministry of Education 2013). Against this backdrop, it is unclear the extent to which the large dropout rate is related to the mismatch between students and the high school curriculum.

The centralized assignment mechanism in the metropolitan area of Mexico City, which allo-

---

[1]Evidence from a variety of settings suggests that school choices are systematically correlated with socioeconomic background, even after controlling for pre-determined measures of ability (e.g. test scores) - see, for instance, Ajayi [2013] for evidence on Ghana and Avery and Hoxby [2012] for the US case.

[2]Throughout the paper we will use upper secondary education and high school indifferently when we refer to grades 10 to 12. We will use middle school and junior high school indifferently when referring to grades 7 to 9.

[3]Definitions of tracking in the academic literature range from nothing more than ability grouping to more elaborate forms that divide students by academic achievement with the explicit intent of delivering a different curriculum, and using different pedagogical methods, for different groups of students (see, e.g., Betts [2011] for a review).

cates students to public high schools, offers an ideal setting to study school preferences and their determinants. The matching algorithm is strategy-proof, which gives us the unique opportunity to infer preferences from individual choices over the quasi-universe of public high school programs in the area. In this context, we explore how financial constraints can affect high school track choices using the assignment of the welfare program *Oportunidades* as a positive shock to household income. The size of the transfer is sizable, amounting to roughly one-third of the median household income in our sample, and the discontinuity in the program assignment based on a pre-determined poverty score allows us to tease out the causal effects of the transfer by comparing households just above and just below the eligibility threshold.

Our estimates show that eligibility for the *Oportunidades* cash transfers increases the probability of choosing the vocational track as first high school option by 4 percentage points. When we account for the imperfect compliance with the program, we find that the probability of choosing the vocational track as first option increases by 6.1 percentage point, which is equivalent to a nearly 55% increase with respect to the sample average. This result is robust across different estimators and specifications. We rule out that the observed changes in students' preferences across tracks are partly driven by program-induced changes in the composition of high school applicants.

Additional evidence gathered from a variety of auxiliary data sources allows us characterizing the costs and benefits of attending different tracks in the context of the COMIPEMS system. When compared to the other more academic-oriented tracks, the vocational track seems indeed to entail a higher financial burden for the poor households in our sample - in terms of both tuition and transportation costs. At the same time, the vocational track is associated with higher labor market returns for those individuals who enter the labor market after completing high school, perhaps due to the presence of a tighter link between the type of contents offered by those programs and the characteristics of the local labor markets under study. Accordingly, we find that the effect of the cash transfer on the probability of choosing a vocational option is concentrated among lower ability applicants (in terms of their academic achievement in junior high school), and for those with more difficult access to vocational programs (in terms of higher distance from their places of residence).

Irrespectively of the educational track, cash transfers seem to shift students' preferred choices toward schools that are located further away from their places of residence and with higher tuition fees. When investigating the potential behavioral responses associated with the change in school

preferences, we find no support either for the hypothesis that a) students' strategically alter their school choice portfolio in order to increase the expected value of the future stream of cash transfers, or that b) students opt for more selective schools. Based on this evidence, we argue that cash transfers affect school preferences in our setting by relaxing the financial constraints that prevent students from choosing the high school track with the highest expected returns.

Changes in track choices induced by the receipt of the cash transfers may also have persistent impacts on educational trajectories later on. In order to inspect this possibility, we exploit another key feature of the COMIPEMS mechanism: placement in the system solely depends on students' elicited preferences and their performance in the admission exam. Since we can measure any change in those two outcomes induced by the receipt of the cash transfers, we are also able to track the effects on high school assignment and longer-term educational outcomes. We find some suggestive evidence that, for students with tighter liquidity constraints, the observed changes in students' preferences over schools translate into a higher probability of being assigned to their most preferred schooling option, as well as into a lower drop-out rate during high school.

This paper broadly speaks to a large body of literature that explores the effects of credit market frictions on human capital investments (see, e.g., Lochner and Monge-Naranjo [2012] for a recent review). Most of the existing literature on school choice decisions considers the role of information frictions. Increasing evidence shows that the degree of accuracy of information about the characteristics of the available schooling alternatives [Ajayi, 2013; Avery and Hoxby, 2012; Bettinger et al., 2012; Dinkelman and Martinez, 2014; Hastings and Weinstein, 2008; Lai et al., 2009; Mizala and Urquiola, 2013] and their associated labor market earnings [Arcidiacono, 2004, 2005; Attanasio and Kaufmann, forthcoming; Kaufmann, forthcoming; Jensen, 2010; Wiswall and Zafar, forthcoming] play a role for both students' and parents' decision making. Our paper contributes to this strand of literature by pointing to the potential role of financial frictions underlying school choice decisions. Overall, our results can be interpreted as evidence that in a developing country context financial constraints can be partly responsible for the mismatch between school type and student ability. We contribute to the literature that studies school preferences [Deming et al., 2014; Hastings et al., 2008; Burgess et al., 2009], showing that at high school level the academic track is an important variable that students weight when making their choices.

Most closely related to our paper, Giustinelli [2014] studies how subjective expected utilities of

both parents and students shape high school track choices. In the same context under study in this paper, Bobba and Frisancho [2014] focus on the role of students' self-perceptions about academic ability as a potential source of distortion for perceived track-specific returns and hence high school choice decisions, while De Janvry et al. [2013] highlights the potential trade-off between drop-out risk and academic benefit behind students' demand for "elite" public high schools.

2 Context and Data

2.1 The School Assignment Mechanism

The Mexican system offers three educational modalities (tracks thereafter) at the higher secondary level: General, Technical, and Vocational Education (*Bachillerato General*, *Bachillerato Tecnológico*, and *Educación Profesional Técnica*, respectively). The technical modalities include the curriculum covered in a general education program but they also incorporate additional courses that allow students to become a technician upon completion of higher secondary schooling. In turn, a student who chose to get a vocational education is exclusively trained to become a professional technician. From 2008 onwards, as result of the Integral Reform of Upper-Secondary Education (*RIEMS*), all three modalities allow students to attend tertiary education, although the timing of adaptation to the new system varied dramatically across states. As result, in the time period covered by our analysis, the option value of attending tertiary education is the same for all three modalities.

Students who want to attend a public high school in the urban area of Mexico City are required to enroll in a centralized and competitive assignment mechanism regulated and administered by the Metropolitan Commission of Higher Secondary Public Education Institutions (COMIPEMS, by its Spanish acronym). Since 1996, the commission brings together nine institutions who have agreed to select candidates through a standardized achievement exam.[4] In 2007, these institutions offered over 238,000 seats in about 700 public schools located in Mexico's capital city as well as

---

[4]The nine institutions who offer schools through the COMIPEMS are: Universidad Nacional Autónoma de México (UNAM), Instituto Politécnico Nacional (IPN), Universidad Autónoma del Estado de México (UAEM), Colegio Nacional de Educación Profesional Técnica (CONALEP), Colegio de Bachilleres (COLBACH), Dirección General de Educación Tecnológica Industrial (DGETI), Dirección General de Educación Tecnológica Agropecuaria (DGETA), Secretaría de Educación del Gobierno del Estado de México (SE), and Dirección General del Bachillerato (DGB).

22 urban municipalities that surround the city.

More details about the COMIPEMS assignment mechanism can be found in Bobba and Frisancho [2014] and Dustan [2014]. Here we stress some aspects of the context that make students' rankings particularly informative about their underlying preferences over schooling alternatives. First, administrative records capture individual revealed preference rankings over a wide range of available high school alternatives, which allows us to accurately measure student-specific ranked orderings over high school tracks. Second, the matching mechanism in place and the large portfolio size that can be submitted imply that the assignment mechanism is strategy-proof [Pathak, 2011]. Since admission probabilities to each school do not play a role when choosing an application portfolio, any effect on choices due to the receipt of the cash transfers is enabled through changes in net expected benefits across high school tracks.[5] Third, official information about school-level academic quality is publicly available. Past cutoff scores for each schooling option have been made available through the COMIPEMS website since 2005.[6] Since the cutoff scores and the mean score of admitted students are almost perfectly correlated, students have access to an excellent proxy for the average peer ability in each school.

2.2 The *Oportunidades* Program

Oportunidades is a conditional cash transfer program that targets poor households in both rural and urban areas of Mexico.[7] The program was first initiated in 1997 in rural areas of Mexico, and by 2001 it began to expand at a rapid rate into semi-urban and urban areas reaching the urban area under study in the second half of 2004. Cash transfers are given on a bimonthly basis to one of adult household members (usually the mother) and come in two forms. The first is a fixed food stipend which is worth 175 MX\$ (around 16 US\$) per month as of the first half of 2005 and it is conditional on family members obtaining preventive medical care. The second is an educational grant which is offered to each child aged 6-21 in the household. To receive the school subsidy, children or youths in participating households have to attend school in one of the subsidy-eligible

---

[5]Even though students are allowed to rank up to twenty options only a minor percentage of them fills up the entire preference sheet; students seem to be choosing a portfolio without binding constraints on the number of options that can be chosen.

[6]This site is frequently checked by the applicants because it has become the main channel to pre-register and it is also a key source of information about the system.

[7]Details of the program can be found in Hoddinott and Skoufias [2004].

grade levels (grades 3-12) for at least 85% of school days. They also cannot receive a subsidy more than twice for the same grade.

Transfers increase with the grade, and they are higher for girls than for boys starting from the first grade of secondary school. Average monthly transfer amounts per child by education level are: 163 MX$ for primary, 355 MX$ (boys), 393 MX$ (girls) for lower secondary, and 603 MX$ (boys), 670 MX$ (girls) for upper secondary. In addition, children who are enrolled in school receive an additional monetary transfer for the acquisition of school supplies at the beginning of the academic year (on an annual basis: 220 MX$ for primary and 275 MX$ for secondary). No household can receive more than 1,055 MX$ per month from a combination of grants for different children. For households with children who are scholarship recipients at the upper secondary level, the transfer is capped at 1,785 MX$. During high school, students can further accumulate funds that are redeemable (under certain conditions) upon graduation from high school.[8]

Although the structure of benefits is identical in rural and urban areas, the procedure by which families become beneficiaries differs. To identify eligible households, program's officials visited every household in eligible rural localities and undertook a census, collecting information on a range of household socio-economic characteristics which would then directly determine the entitlement to the program benefits. In urban areas a comprehensive census was deemed to be too costly, so that an element of self-selection in the registration of beneficiaries was introduced. To determine initial eligibility for the urban program, three general steps are taken: (i) identification of high poverty areas to be served; (ii) information campaigns to promote the program; and (iii) identification of eligible families. If a household visits program centers, information is collected through a household questionnaire and these data are further verified during a home visit. A subset of these characteristics was used to apply a previously developed proxy-means targeting approach, whereby numerical weights were assigned to human capital and household assets, as well as characteristics of their communities to calculate a household poverty index (score), with a higher score denoting a higher level of poverty.[9]

---

[8]For students registered in the program since the last year of lower secondary school, this additional amount is about 3,000 MX$.

[9]The factors and weights are based on an analysis of the determinants of poverty conducted at the initiation of the program, which used a discriminant analysis to identify variables that discriminate best between poor and non-poor households and used the output of the analysis to develop an equation (discriminant score) for computing a poverty index [Skoufias et al., 2001].

2.3 Sample Description

Our analysis is restricted to households living in the town of *Ecatepec de Morelos*, which is located in the *Estado de Mexico* in the outskirts of Mexico City's Federal District.[10] In 2004, a census household survey (ENCASEH) was administered to 18,593 households to assess their eligibility for the *Oportunidades* transfer. The roster of the *Oportunidades* recipients for *Ecatepec de Morelos* further allows to assess whether and when the households eligible for *Oportunidades* started receiving any monetary grant.

For all the years between 2005 and 2010 we have information on the universe of COMIPEMS applicants within the entire metropolitan area of Mexico City.[11] The official data collected within the COMIPEMS system feature students' address of residence, socio-demographic characteristics (gender, age, household income, parental education and occupation, personality traits, among others) and schooling trajectories (GPA in lower secondary school, study habits, among others) as well as the full ranked list of schooling options requested during the application process and related information about students' placement in the system (including their score in the admission exam).

All COMIPEMS applicants have a 16 digits unique student identifier (CURP), that is generated by combining information on student's name, surname, date of birth and state of birth, plus a 2 digit random generated number. All the relevant demographic information is collected by the ENCASEH, allowing us to construct a "pseudo-CURP", that only differs from the student identifier in the 2 digit random generated number. After removing all the individuals for which we have missing information or a "pseudo-CURP" that can be potentially matched with 2 or more CURPS, we are left with a sample of 6,173 COMIPEMS applicants in the age group 14-20, for which we have information on the proxy-means score used to assign the *Oportunidades* transfer.

After excluding those applicants that lack basic sociodemographic information, we are left with a final sample of 5,232 students who applied in the COMIPEMS system during the period com-

---

[10]The Ecatepec municipality is the most densely populated in the country, with a population of 1,656,107 inhabitants (INEGI 2010). In 2011, Ecatepec was third in the country's poverty ranking , with 723,559 individuals living under the poverty line (CONEVAL). Ecatepec's economy is based on industry, commerce and services. Over 1,550 medium and small enterprises are registered in its territory. A large portion of the city's inhabitants commute to the Federal District for labor or academic activities every day. The city also receives a large number of workers commuting from other municipalities.

[11]In this way we are able to track households that move outside the town of *Ecatepec*, but stay within the Mexico City area.

prised between 2005 and 2010.[12] Of those, 3,180 (61%) belong to households which were deemed eligible for the *Oportunidades* benefits - i.e. the value of their proxy-mean score is greater or equal than 0.69. Among eligible students, 2,161 (68%) are reported receiving at least one payment from *Oportunidades* before applying to the COMIPEMS system.[13] As a result of a process of program expansion in urban areas which took place in the end of 2008, a very small fraction (1.2%) of ineligible applicants in our sample are reported receiving some program benefits before applying to the COMIPEMS system.

For the median household in our sample, the *Oportunidades* transfer is between 27 and 28 percent of total household income. The large size of the income shock in our sample likely reflects the selection induced by the participation into the COMIPEMS system. When compared to the rest of the families in the ENCASEH survey, those with at least one child who applies for upper secondary education have in fact more children currently enrolled in grades 3-12. In fact, transfer amount for program eligible families who are not in the COMIPEMS sample are substantially lower: between 14 and 16 percent of total household income for the median household in our sample.[14]

Only 9 percent of the COMIPEMS applicants in our sample list a vocational program as their first option, while 44 percent and 47 percent of the applicants respectively opt for the technical and the academic track. On average, when compared to the latter group of students, those who prefer a vocational education tend to perform worse in school (as measured by the score in the admission exam and in the cumulative grade point average in lower secondary), and they tend to come from more disadvantaged socio-economic backgrounds (as measured by parental education, the *Oportunidades* eligibility score and the relative share of those who report to be working - with or without a wage).

---

[12]Only a small percentage (about 3%) of students who have filled the ranking of their preferred options, do not take part in the COMIPEMS exam. We could not geocode the address of residence for roughly 10% of applicants. However, neither sample attrition rates vary systematically around the program eligibility threshold.

[13]Program take-up rates are fairly high when compared with the corresponding figures reported in the existing evaluation studies of the urban component of *Oportunidades* [Angelucci and Attanasio, 2009]. Previous studies used the urban evaluation surveys (ENCELURB) which entails roughly 18-24 months between program inception and observed outcomes, whereas we observe eligible households for up to six years after program inception. In fact, take-up rates in our sample increase from 40% in 2005 to 79% in 2010.

[14]Those figures are in line with previous studies that considered the urban component of the *Oportunidades* program [Angelucci and Attanasio, 2013].

2.4 Auxiliary Data Sources

We combine the main sample described in the previous section with four administrative data sources. First, the biannual Mexican school census which collects information on school-level yearly trajectories - e.g. enrollment, failure and drop-out rate, school infrastructure, teachers' and school principals' main characteristics as well as detailed information on the attendance fees that students have to incur upon registration in a given school: tools, uniforms, monthly payments, registration and tuition. This information can be conveniently linked with the full list of COMIPEMS schooling options through a unique school identifier (*Claves de Centros de Trabajo* - CCT) during the period 2005-2010. In addition, geocoded information allows us to compute geodesic distances between students' places of residence and the high school programs offered by the COMIPEMS system.

Second, we employ a sub-module of the third round of the 2008 national employment survey (ENOE) which records retrospective information on the academic trajectories of individuals in the age group 15-34, who passed at least one year of upper secondary education, including the track attended in high school and whether college education was attended or not. Wage and employment information comes from the ENOE that is considered the most reliable source of wage data for Mexico. This survey is representative at the State-level and further allows to distinguish between rural, semi-urban and urban areas depending on the population size of the communities of residence of the surveyed individuals. We thus consider as the relevant labor market for the COMIPEMS applicants in the city of Ecatepec the urban sections of the State of Mexico and the Federal District.

Third, we use data from a 2009 survey collected on a nationally-representative sample of students who take a nationally standardized end of high school test (ENLACE). The so called *EN-LACE de contexto* gathers, among others, information on expected monthly earnings five years from the moment of the survey depending on two hypothetical scenarios of educational attainments - high school completion and university degree. The answers are given using a pre-codified set of brackets.[15] As before, we restrict the sample to the urban sections of the State of Mexico and

---

[15]The earnings brackets for both questions are: i) 4,000 MX$ or less; ii) 4,001 MX$ to 7,000 MX$; iii) 7,001 MX$ to 10,000 $; iv) 10,001 MX$ to 15,000 MX$; v) 15,001 MX$ to 20,000 MX$; and vi) more than 20,000 MX$. The questions are the following:

1. If you do not obtain a university degree, what monthly income do you expect to have on average five years from now?

the Federal District. Through the school identifiers (CCT), we assign each individual in the resulting sample to one of the three high school tracks, thereby allowing us to measure how expected returns vary across those.

Fourth, we rely upon data on economic activity taking place in private establishments with a fixed location in urban areas from the 2008 Mexico's Economic Census, which classifies activities with considerable detail - up to 6 digits of the North American Industrial Classification System (NAICS). Average figures on firm sales, value added, number of workers and labor remunerations for the municipality of Ecatepec provide us with a detailed description of the key economic sectors in the context under study, and allow linking the main drivers of the local labor demand with the different curricular specializations provided by the vocational programs of the COMIPEMS.

3 Empirical Strategy and Results

3.1 A (Fuzzy) Regression Discontinuity Design

The eligibility for the *Oportunidades* transfer solely depends on whether the household poverty score exceeds or not a fixed cutoff, that is time invariant during the period under study and unknown by potential beneficiaries. Hence, the likelihood of receiving the program benefits can be interpreted as the result of a local randomization in a neighborhood of the eligibility cutoff [Lee, 2008].

Formally, let X denotes the household eligibility score, c the cutoff value of eligibility, and B a program treatment indicator. The local average treatment effect (LATE) of *Oportunidades* transfers on track choice (Y) is identified by

$$\frac{\lim_{\epsilon \to 0}\{E(Y|X=c+\epsilon) - E(Y|X=c-\epsilon)\}}{\lim_{\epsilon \to 0}\{E(B|X=c+\epsilon) - E(B|X=c-\epsilon)\}}, \tag{1}$$

where the numerator in equation 1 defines the Intention to Treat (ITT) effect of *Oportunidades* transfers on track choices. When the denominator in equation 1 is exactly one (perfect compliance), the design is said to be sharp. If it is less than one, the design is said to be fuzzy. In this paper, we

---

2. If you obtain a university degree, what monthly income do you expect to have on average five years from now?

have a case of fuzzy-RDD as compliance to the program is imperfect (see Section 2.2).

Ideally, we would like to estimate both ITT and LATE parameters in a neighborhood of the program eligibility threshold c. Given our sample size, the number of observations around the threshold might be relatively small and thereby potentially compromising the resulting estimates [Lee and Lemieux, 2010]. In our main specifications we thus use a parametric functional form that exploit the entire sample.

Formally, we can estimate the ITT effect of the eligibility for the *Oportunidades* program on track choices of student i using the following equation:

$$Y_i = \beta_0 + \beta_1 \mathbf{1}(X_i > c) + \beta_2 f(X_i - c) + u_i, \tag{2}$$

where β_1 represents the main parameter of interest, and u_i is a mean zero error term. The term $(X_i - c)$ accounts for the influence of the running variable on both track choices and program assignment in a flexible nonlinear function $f(\cdot)$. In our main specification, we use a quadratic spline as functional form for the function $f(\cdot)$.[16] ϵ_i and η_i are mean zero error terms. In order to account for the non-perfect compliance with the transfer program, we can estimate the following:

$$B_i = \alpha_0 + \alpha_1 \mathbf{1}(X_i > c) + \alpha_2 f(X_i - c) + \epsilon_i, \tag{3}$$

$$Y_i = \gamma_0 + \gamma_1 B_i + \gamma_2 f(X_i - c) + \eta_i, \tag{4}$$

where B_i takes the value 1 if the household of student i is receiving the *Oportunidades* transfer, 0 otherwise. The main parameter of interest is γ_1, that captures the LATE of *Oportunidades* transfers on track choices.

The advantage of the parametric approach is the increased statistical power due to the larger sample. One potential disadvantage is the bias produced by individuals who are located further away from the cutoff when $f(\cdot)$ is not correctly specified. For this reason, we complement our result showing the estimates of Local Linear Regression (LLR) models where the optimal bandwidth is calculated using the methods proposed in Imbens and Kalyanaraman [2012].

In order to identify the parameter β_1 in equation 2 two main conditions have to be satisfied: (i)

---

[16]The resulting estimates are robust to alternative degree of the polynomial (results available upon request).

continuity of the assignment variable around the eligibility threshold, and (ii) in the absence of the treatment, track choices would not display discrete changes around the threshold. Assumption (i) is akin to imposing that households cannot manipulate the assignment variable in order to result eligible for the transfer, whereas (ii) implies that the distribution of other variables that might be potentially relevant for track choices does not change discontinuously in the surroundings of the eligibility threshold. Two additional assumptions are needed in order to identify the LATE parameter in equations 3-4: (iii) monotonicity of the treatment assignment, and (iv) scoring above threshold cannot impact track choices except through the effect of the transfer (exclusion restriction).

3.2   Validity of the RD Design

We start by assessing the continuity of the assignment variable. Martinelli and Parker [2009] finds evidence that in order to increase the chances of being eligible for *Oportunidades*, households tend to under-report goods and desirable home characteristics. In the absence of perfect monitoring of the self-reported information, we might thus observe a discrete jump in the distribution of the household poverty score immediately above the eligibility threshold, thereby suggesting that households can manipulate the assignment variable. Using the sample of all households in our sample with at least one child in the COMIPEMS exam we formally test for the presence of a discontinuity in the assignment variable at the cutoff of program eligibility, in the spirit of McCrary [2008]. Figure 2 depicts a kernel regression interpolation along with the confidence intervals of the empirical distribution of the assignment variable at the points below and above the cutoff. There is no evidence that in our population of interest households are manipulating the score in order to increase the probability of being eligible for the transfer. Visual inspection reveals the presence of a small drop (rather than a bump) immediately above the eligibility cutoff, although the null hypothesis of a smooth density cannot be rejected: the point estimate of the log difference in height between the two interpolating kernel regressions is -0.119 (std. err.= 0.075).

We next provide evidence in support of the assumption that in the absence of the treatment, track choices would have not changed discretely around the threshold. Figure 3 displays six socio-demographic pre-determined characteristics that are plausibly correlated with track choice decisions: students' age, ethnicity, household income, parental education, the number of siblings and

whether the student lives with both parents. The graph does not reveal any discrete jump around the eligibility cutoff for these variables, and the corresponding regression estimates largely confirm this.[17]

The graph presented in panel a of Figure 4 shows that the probability of taking the transfer is remarkably flat for those households whose poverty score is above the eligibility threshold. This provides support for the monotonicity assumption of the treatment assignment. A potential violation might have occurred if the cost of complying with the program conditionalities had increased with the poverty score, thereby decreasing the likelihood to receive the program benefits for households with relatively high values of the eligibility score. Neither previous work on *Oportunidades* in urban areas [Gonzalez-Flores et al., 2012] nor the results presented here tend to support this hypothesis.

The interpretation of the LATE parameter defined in equation 1 crucially relies on the assumption that scoring above the eligibility threshold can affect school preferences only by affecting the probability of receiving the *Oportunidades* transfer. To the best of our knowledge, there are no other government-sponsored programs that use the same poverty score and its related assignment rule.

3.3 Main Results

We first conduct a graphical analysis in order to document the discontinuity effects of the program transfers on the likelihood of choosing one of the three educational tracks (vocational, technical and academic) as a first option within the COMIPEMS school assignment system. Figure 4 plots (circles) sample averages computed on 0.10 consecutive brackets of the poverty score along with two non-parametric estimates of the main variables of interest. These estimates are obtained using a separate locally-weighted smoothing regression (dotted lines) and local linear regressions (continuos lines) on the left and right of the cutoff points for a discontinuity sample of one point of poverty score at each side - which roughly entails 70% of the overall sample of COMIPEMS applicants.

Jumps in the plots show the effect of crossing the threshold on the variables of interest, offering a graphical interpretation of the ITT effect as defined by the numerator of equation 1 and the

---

[17]Results are available upon request.

14

takeup of the *Oportunidades* transfer, the denominator of the same equation. The impact of the transfer on track choices can then be gauged visually by inspecting the ratio of the jump in the probability of choosing a given track and the jump in the probability of receiving the transfer (panel a). The graphical evidence seems to reveal the presence of a positive effect of the receipt of *Oportunidades* on the probability of choosing a high school program which belongs to the vocational track (panel b). Accordingly, the transfers seem to be associated with a decrease in the probability of choosing the technical or the academic track, with possibly a more pronounced effect for the former, although no clear pattern emerges from visual inspection of panels c and d of Figure 4. Besides, away from a close neighborhood of the discontinuity there is a clear declining trend in the probability of choosing the vocational track as the poverty score increases, whereas, again, no clear trend emerges for the other two tracks.

In Table 2 we present regression evidence for the estimation of the β_1 and γ_1 coefficients of equations 2-4 using a quadratic spline in the poverty score in order to control for the influence of the running variable on both track choices and program assignment. The ITT effect on the probability of choosing the Vocational track is 4 percentage points and it is statistically significant at 5% level (column 1). When we account for the imperfect compliance with the *Oportunidades* transfer, we find that the corresponding LATE is equal to 6.1 percentage points (column 2). Compared to the 9.2% baseline probability of choosing the vocational track as first option, the relative size of this effect is definitely large.

The estimated coefficients of both the ITT effect and the LATE of the transfer on the probability of choosing the academic track as first option are small in magnitudes and they are not statistically significant (columns 3 and 4). The probability of choosing the technical track as first option experiences a drop of 5.1 percentage points when we estimate the ITT (column 5) and 7.9 percentage point when we estimate the LATE (column 6). The magnitudes of those negative effects for the technical track are in line with the positive effects observed for the vocational track. Their lack of statistical significance is arguably related to the relatively small size of our sample. In fact, the standard deviation of the dependent variable nearly doubles in columns 5 and 6, so that the minimum effect that can be statistically detected at conventional significance levels is much larger.

As a specification check, in Table 3 we report non-parametric estimates of the ITT effects of the

cash transfer on track choices obtained by fitting local linear regression models for a subset of the observations which are in a neighborhood of the eligibility cutoff, as determined using the optimal bandwidth criterion in Imbens and Kalyanaraman [2012]. The results are remarkably consistent in both significance and magnitude with the ones just discussed.

One potential concern for the interpretation of these findings is that the eligibility for *Oportunidades* might have changed the composition of the COMIPEMS applicants by, for instance, inducing lower-ability students to take part in the school assignment system.[18] In order to address that concern, we estimate equation 2 to assess the impact of the *Oportunidades* eligibility on the probability of taking part in the COMIPEMS system, the score in the assignment exam and the Grade Point Average (GPA) in junior high school. Results based on the estimation of parametric specification that includes a quadratic spline in the poverty score are reported in Table 4.[19] For all these outcomes, the effects of *Oportunidades* transfers is small and not statistically significant, thereby lending some support to the view that the observed changes in students' preferences across tracks are not the result of changes in the composition of the population under study.

4 Channels

In a simple school choice model with financial constraints, the *Oportunidades* transfer acts as an income shock conditional on school attendance and thereby tilts choices toward a given track for the students who expect higher benefits. In this Section, we first present some descriptive evidence gathered from a variety of auxiliary data sources (see Section 2.4 for details) which sheds light on the presence of important differences in the costs and benefits of attending different tracks in the context of the COMIPEMS system. We next discuss additional evidence based on the fuzzy-RDD empirical framework presented in Section 3.1 which is consistent with the notion that the transfer has increased the willingness to opt for the vocational track by relaxing the financial constraints for some students. We conclude by presenting some evidence suggesting that the receipt of the

---

[18]Another potential source of selection can be induced by the positive effect of *Oportunidades* on migration [Angelucci, forthcoming]. If higher (lower) ability students are more likely to migrate out of the Mexico City metropolitan area upon receiving the transfer, the sample of the COMIPEMS applicants might display a negative (positive) selection bias.

[19]Results based on non-parametric specifications, not displayed for space reasons, are consistent with those presented.

program transfer acts as an income shock, rather than changing applicants' school choices through other channels.

4.1 Costs and Benefits of Track Choice

We first document important differences across high school tracks in terms of the costs associated to school attendance. First, the average yearly tuition fees of a vocational option in the COMIPEMS system amount to 3,986 MX$ (13 percent of the average household income in our sample), as opposed to 2,644 MX$ for a technical option costs and 3,521 MX$ for an academic option (see Panel a in Table 5). The average difference in tuition costs between vocational and technical options is therefore substantial as it accounts for roughly 5 percent of the average household income.

Second, vocational options tend to be situated further away from applicants' places of residence when compared to technical and academic options (see Panel a in Table 5 and Fig. 1). For instance, the closest technical school is located on average 2 Km away from applicants schools of origin, whereas the closest vocational school is located 3.2 Km away. Taken together, these two pieces of evidence suggest that, especially relatively to the technical track, the vocational track may entail a higher financial burden for the poor households in our sample - in terms of both tuition and transportation costs.

We next provide evidence on the labor market returns associated to each high school track. We start by computing the average hourly earnings in 2008 for employed individuals aged 16-35 who reside in urban areas of the State of Mexico and the Federal District. Among individuals with completed secondary and no tertiary education, average hourly earnings are 14 percentage points higher for those who attended the vocational track vis-a-vis the academic and technical tracks. Perhaps not surprisingly, the opposite holds for individuals with tertiary education: hourly earnings are 8-10 percentage points lower for those who attended the vocational track (see the fourth and fifth row of Panel a in Table 5).[20]

The higher labor market returns of the vocational track among individuals with secondary

---

[20]A similar pattern emerges using the nationwide urban sample of the ENOE in the context of Mincer-type regressions, which also control for (potential) experience. The corresponding OLS estimates indicate that the vocational track is associated with a positive return of 0.057 (std. err.=0.021) for individuals with secondary education and a negative return of 0.125 (std. err.=0.034) for those with tertiary education.

education observed in the labor survey data can affect individual preferences only to the extent that COMIPEMS applicants can rely on this information. While we do not have information about students' expectations at the moment of the application, we can observe students' expected returns during the last year of high school, as measured by the *Enlace de contexto*. Students' subjective expectations about earnings five years after high school completion across the different high school tracks in the metropolitan area of Mexico City are broadly consistent with the ENOE data (see Figure 5).

Vocational options in Mexico are often considered of lower academic quality, but on average they display a better provision of school inputs that are more likely to favor labor market entry upon finishing high school, compared to the more academic tracks. As shown in Panel b in Table 5, vocational options display the lowest ratios of computers per student and the highest number of workshops per student. Although the number of students per teacher (18.55) is higher than the academic track (18.16), it is much lower than the technical track (20.46).

The vocational options also display tighter links with the characteristic of the local labor market. Figure 6 depicts the different areas of specialization of the technical programs offered within the COMIPEMS system according to whether the students in our sample opt for a technical or a vocational program in their solicited first option. Among those who choose a technical program, almost 40 percent choose a program that covers mixed, and presumably more general, specializations, as opposed to the vocational track where the programs chosen seem to be more geared toward career-specific training. Roughly one-third of the COMIPEMS applicants in our sample who choose a school from the vocational track as their first option opt for the auto repair specialization. According to the Mexican Economic Census, the auto-repair sub-sector in the municipality of Ecatepec stands above the 95th percentile in the distribution of all the service sub-sectors in terms of employees' wages, number of firms, number of employees and (gross) value added. This evidence provides further support to the hypothesis that COMIPEMS applicants are aware of the labor market returns of the vocational options.

Overall, these different pieces of evidence seem consistent with the notion that for those students who expect to enter the labor market after high school completion, the vocational track seems a profitable and yet more costly alternative when compared to the other two more academic-oriented tracks. A pilot survey conducted in 2009 among the *Oportunidades* recipients in the city

of *Ecatepec de Morelos* provides some basic information on schooling expectations in our setting. Among the 1,822 individuals aged 14-15, roughly 40 percent report secondary education as the highest schooling level that they expect to complete. Hence, there is a potentially very large fraction of high school entrants for whom the vocational track should be attractive. The size of the potential demand for the vocational track helps to contextualize the large effect of the cash transfers on track choices documented in Section 3.3.

4.2   Empirical Evidence

High-ability students are more likely to attend university, and hence they foresee the higher labor market returns of an academic-oriented track. Those students are also more likely be less financially constrained due to higher access to merit-based scholarship at the upper secondary level.[21] We thus expect *Oportunidades* to have a larger impact on high school track preferences among lower ability students. We use information on the cumulative Grade Point Average (GPA) in lower secondary and accordingly classify as high-ability and low-ability students whose GPA is above and below the median respectively. We allow the ITT effect to vary with the level of ability and we report the results in column 1 in Table 6. For those with a high GPA the effect of *Oportunidades* on the probability of choosing the vocational track as first option is small and not statistically significant from zero, as opposed to a large and statistically significant effect (5.7 percentage points) for those with a GPA below the median.

Transportation costs may constrain school choices, especially in low income families. If *Oportunidades* is changing preferences for high school tracks by relaxing the financial constraints, we do expect the effect on the probability of choosing the vocational track to be stronger among those applicants who live further away from a vocational option. We pull together the data on the entire set of preferences of all the individuals in our sample and we consider this as the universe of the high schools that students in our sample can potentially apply to. For each student in our sample, we compute the distance from its residence address to the closest vocational option and we use this as a proxy for the transportation cost that students have to sustain in order to attend a vocational

---

[21]For instance, students whose COMIPEMS score are high enough to enter *UNAM* options are provided with direct access to university programs of the same institution - among the best ones in the country - and are automatically granted a scholarship that covers most of the school-related expenses both at secondary and tertiary level.

program. We study how the ITT effect on the probability of listing a vocational as first option varies for low and high distance students, as defined by being below and above the median distance from the closest Vocational option. The results are reported in column 4 in Table 6. The size of the ITT coefficient is large (5 percentage point) and statistically significant for high-distance students, while it is small and not statistically significant for low-distance students. Nevertheless, when we test whether the two coefficients are statistically different, we cannot reject the null hypothesis of no difference (p value=0.136).

If the eligibility for the cash transfer increases the propensity to choose the vocational track by weakening the household financial constraints, then we would expect students to prefer more expensive - either in terms of tuition or transportation costs - options. For each option in the portfolio, we thus construct the tuition cost and the distance from the applicants' places of residence associated with the school where the option is located.[22] Roughly 30% of schooling options feature 0 tuition costs. Those refer mainly to "elite" schools belonging to sub-systems which are, by far, the most demanded by relatively high-ability applicants (UNAM offers general education programs while IPN administers technical education programs). By taking logs we automatically exclude those schooling options and thus focus on the intensive margin of tuition fees. We then estimate the ITT effect of the cash transfers on two outcomes: the logarithm of the tuition cost of the first portfolio choice and the distance from students' place of residence to the first choice. Results are reported in Table 7. We find that the eligibility for *Oportunidades* significantly increases the tuition cost associated with the preferred option in a range between 7.6% and 10.7%, depending on the specification (columns 1-3). Looking at the effect of the cash transfer on the average willingness to commute to the preferred school, we find a positive and significant impact of roughly 1.5 Km (columns 5-6) - although this effect is not significant in the parametric specification (column 4).

The results presented in this section, although not conclusive, provide some evidence in support of the financial constraints hypothesis. The probability of choosing the vocational track as first option increases for those students who live further away and those with have lower scores in the GPA. Consistently, we find that cash transfers have a positive impact on the tuition and the transportation costs that students are willing to pay in order to attend their preferred schooling

---

[22]If two options within the same school have different tuition costs - e.g. due to the different types of materials required, the outcome variable would be measured with error. Nevertheless, the measurement error is unlikely to be different for options located above and below the eligibility threshold.

option.

4.3 Alternative Channels

As described in Section 2.2, *Oportunidades* transfers are conditional on health and schooling behaviors. Although there is no component of the transfer that is directly linked to the high school track attended, we can not a priori rule out the possibility that our results are the outcome of the conditional nature of the transfer. The requirements that each eligible child has to be enrolled in school for receiving the scholarship component of the transfer and that she can not receive the transfer more than twice for the same grade might have a direct effect on school choices. For instance, students' may strategically select relatively easier schools so as to increase their chances of passing grades and receiving *Oportunidades* scholarships up until the end of upper secondary.

We use equation 2 to test whether the eligibility for the cash transfer had an impact on the level of difficulty of the most preferred high school option in applicants' portfolios. Under the assumption that schools' achievement standards partly depend on the student ability composition, one plausibly good proxy measure for the degree of difficulty of a given schooling option is the relative cutoff score in the admission exam due to the assignment algorithm of the COMIPEMS system (see Section 2.1 for details). Regression results presented in columns 1-3 in Table 8 show that, irrespective of the specification, the impact of the eligibility for the cash transfer on the cutoff score of the first option requested in the COMIPEMS system is small and not statistically significant from zero.

One potential concern with this measure is that it does not encompass the potential role of schooling inputs and the different pedagogical methods on students' (perceived) study effort and probability of progressing through grades. We thus alternatively employ the school-average performance among twelfth graders in a national standardized test aimed at measuring academic achievement (ENLACE) in language and math as a broader measure of school difficulty, at the cost of decreasing sample sizes due to missing average scores for roughly 30% of the high school options in our sample. The estimates are reported in columns 4-9 of Table 8 and they consistently reveal no effects of the eligibility for the *Oportunidades* scholarships. We interpret these results as evidence that the results discussed in Section 3.3 are not the artifact of conditionalities' compliance

among children in eligible households.[23]

5   Further Evidence

While the primary objective of our study is to understand how the *Oportunidades* transfer changed student preferences over high school tracks, here we want to assess whether the observed changes in preferences ultimately lead to better educational outcomes. Technical options display on average lower tuition and transportation costs than the vocational ones, but they require higher scores to be admitted. Therefore, more financially constrained students might *de facto* reduce the probability of being assigned to their first option in the attempt to pursue a more affordable one. For this purpose, we study whether the cash transfers increase the probability of being assigned to the first option. Column 1 in Table 9 shows a 4 percentage point increase, but the effect is not statistically significant. Final assignment depends both on student's ranking and the score in the COMIPEMS exam. Since the estimates reported in Table 4 do not show any effect on the exam, we treat the COMIPEMS score as a plausibly exogenous variable. Including score fixed effects increases the size of the coefficient but the effect, that corresponds to about 0.12 standard deviation of the dependent variable, is not statistically significant (column 2). Yet, this effect is likely to vary with the extent of the financial constraints, as measured by distance from students places of residence to the closest vocational option. In fact, we find that the coefficient is larger and statistically significant (at the 5% level) for students who live further away from schools offering vocational programs (column 3).

By relaxing the financial constraints for some students, cash transfers are likely to improve the allocation of students among school tracks, and this in turn should lead to better outcomes later on. Because we lack individual-level data on graduation, taking a standardized achievement test (ENLACE) in 12th grade is used as a proxy for graduation. Only students on track to graduate at the end of the school year are registered to take the exam. Previous studies [De Janvry et al., 2013; Estrada and Gignoux, 2014] present evidence that this is a good proxy, in particular because there is no evidence that schools administer the exam strategically. On average, 44% of the students in

---

[23]As an additional test, we use the school-level June pass rates in the academic year 2005-2006 in order to further corroborate that students above the eligibility threshold do not prefer easier schooling options. Results (available upon request) are consistent with the estimates reported in Table 8.

our sample take this exam, and only 8% of them do so from the vocational track. We thus study whether the eligibility to *Oportunidades* increases the probability of high school completion in the vocational track. The estimation results which are displayed in columns 4 and 5 of Table 9 show a positive but not statistically significant effect in the entire sample. Again, we a find larger and statistically significant effect (at the 10% level) when we focus on those students who are more financially constrained, as measured by their distance to the closest school offering a vocation program (column 6).

Most of the results presented in this section are not statistically significant at the conventional level and this might be arguably related to the limited number of observations in our sample. Beyond school choice decisions, there may be other channels through which *Oportunidades* can affect medium-term academic trajectories. Nevertheless, taken together, this evidence is suggestive that cash transfers, by relaxing the financial constraints that prevent low-income students from attending a vocational school, may have persistent impacts on both school placement and later academic trajectories.

6   Conclusions

There is little systematic evidence on the factors underlying students' (and parents') demand for the different educational modalities. Especially in developing countries, financial constraints can induce students from disadvantaged backgrounds to opt for school options that do not match either with their skills or their career expectations. In this paper, we have explored the extent to which differences in costs and benefits across high school tracks affect school choice decisions within a high-stake assignment mechanism in the metropolitan area of Mexico City.

Quasi-experimental evidence which exploited the discontinuity in the eligibility for the cash transfer program *Oportunidades* documented that the receipt of an income shock increases by 6.1 percentage points the probability of choosing the vocational track for the sub-population of students in the neighborhood of the program eligibility cutoff. Although this is by construction a local effect that is difficult to extrapolate to other segments of the population of applicants in this context, it draws on a policy-relevant segment of low-income students in an urban setting of a large developing country.

Consistent with a simple school choice model with financial constraints, this effect is more pronounced among students who are more likely to reap the higher returns from a vocational education and those who have higher costs in accessing the associated school facilities. Among the latter group, we have also shown that these short-run responses to the cash transfer can translate into better academic trajectories in high school. These findings reveal the presence of an untapped demand for vocational education which is hindered by credit market imperfections. In this sense, demand-side subsidies which partly cover tuition and/or transportation costs (e.g. school vouchers) may be effective policy tools to increase enrollment in vocational education at the secondary level.

References

Ajayi, K. [2013], School Choice and Educational Mobility: Lessons from Secondary School Applications in Ghana, mimeo, Boston University - Department of Economics.

Angelucci, M. [forthcoming], 'Migration and financial constraints: Evidence from Mexico', *Review of Economics and Statistics* .

Angelucci, M. and Attanasio, O. [2009], 'Oportunidades: Program Effect on Consumption, Low Participation, and Methodological Issues', *Economic Development and Cultural Change* **57**(3), 479–506.

Angelucci, M. and Attanasio, O. [2013], 'The Demand for Food of Poor Urban Mexican Households: Understanding Policy Impacts Using Structural Models', *American Economic Journal: Economic Policy* **5**(1), 146–78.

Arcidiacono, P. [2004], 'Ability sorting and the returns to college major', *Journal of Econometrics* **121**(1-2), 343–375.

Arcidiacono, P. [2005], 'Affirmative Action in Higher Education: How do Admission and Financial Aid Rules Affect Future Earnings?', *Econometrica* **73**(5), 1477–1524.

Attanasio, O. and Kaufmann, K. [forthcoming], 'Education Choices and Returns to Schooling: Intrahousehold Decision Making, Gender and Subjective Expectations.', *Journal of Development Economics* .

Avery, C. and Hoxby, C. [2012], The Missing "One-Offs": The Hidden Supply of High Achieving, Low Income Students. NBER Working paper No. 18586.

Bettinger, E. P., Long, B. T., Oreopoulos, P. and Sanbonmatsu, L. [2012], 'The Role of Application Assistance and Information in College Decisions: Results from the H&R Block Fafsa Experiment', *The Quarterly Journal of Economics* **127**(3), 1205–1242.

Betts, J. R. [2011], *The Economics of Tracking in Education*, Vol. 3 of *Handbook of the Economics of Education*, Elsevier, chapter 7, pp. 341–381.

Bobba, M. and Frisancho, V. [2014], Learning About Oneself: The Effects of Signaling Academic Ability on School Choice. Working Paper.

Burgess, S., Greaves, E., Vignoles, A. and Wilson, D. [2009], What Parents Want: School preferences and school choice, The Centre for Market and Public Organisation 09/222, Department of Economics, University of Bristol, UK.

De Janvry, A., Dustan, A. and Sadoulet, E. [2013], Flourish or Fail? The Risky Reward of Elite High School Admission in Mexico City. Working Paper.

Deming, D. J., Hastings, J. S., Kane, T. J. and Staiger, D. O. [2014], 'School Choice, School Quality, and Postsecondary Attainment', *American Economic Review* **104**(3), 991–1013.

Dinkelman, T. and Martinez, C. [2014], 'Investing in Schooling In Chile: The Role of Information about Financial Aid for Higher Education', *The Review of Economics and Statistics* **96**(2), 244–257.

Dustan, A. [2014], Peer Networks and School Choice under Incomplete Information. Working Paper.

Dustmann, C., Puhani, P. A. and Schönberg, U. [2014], The Long-Term Effects of Early Track Choice, IZA Discussion Papers 7897, Institute for the Study of Labor (IZA).

Estrada, R. and Gignoux, J. [2014], Benefits to elite schools and the formation of expected returns to education: Evidence from Mexico City. Working Paper.

Giustinelli, P. [2014], Group Decision Making with Uncertain Outcomes: Unpacking Child-Parent Choice of the High School Track, mimeo, University of Michigan - Department of Economics.

Gonzalez-Flores, M., Heracleous, M. and Winters, P. [2012], 'Leaving the Safety Net: An Analysis of Dropouts in an Urban Conditional Cash Transfer Program', *World Development* **40**(12), 2505–2521.

Hastings, J., Kane, T. and Staiger, D. [2008], Heterogeneous preferences and the efficacy of public school choice. Combines and replaces National Bureau of Economic Research Working Papers No. 12145 and 11805.

Hastings, J. S. and Weinstein, J. M. [2008], 'Information, School Choice, and Academic Achievement: Evidence from Two Experiments', *The Quarterly Journal of Economics* **123**(4), 1373–1414.

Hoddinott, J. and Skoufias, E. [2004], 'The Impact of PROGRESA on Food Consumption', *Economic Development and Cultural Change* **53**(1), 37–61.

Imbens, G. and Kalyanaraman, K. [2012], 'Optimal Bandwidth Choice for the Regression Discontinuity Estimator', *Review of Economic Studies* **79**(3), 933–959.

Jensen, R. [2010], 'The (Perceived) Returns to Education and The Demand for Schooling', *Quarterly Journal of Economics* **125**(2), 515–548.

Kaufmann, K. [forthcoming], 'Understanding the Income Gradient in College Attendance in Mexico: The Role of Heterogeneity in Expected Returns', *Quantitative Economics* .

Kerr, S. P., Pekkarinen, T. and Uusitalo, R. [2013], 'School Tracking and Development of Cognitive Skills', *Journal of Labor Economics* **31**(3), 577 – 602.

Lai, F., Sadoulet, E. and de Janvry, A. [2009], 'The Adverse Effects of Parents' School Selection Errors on Academic Achievement: Evidence from the Beijing Open Enrollment Program', *Economics of Education Review* **28**(4), 485–496.

Lee, D. S. [2008], 'Randomized experiments from non-random selection in U.S. House elections', *Journal of Econometrics* **142**(2), 675–697.

Lee, D. S. and Lemieux, T. [2010], 'Regression Discontinuity Designs in Economics', *Journal of Economic Literature* **48**(2), 281–355.

Lochner, L. and Monge-Naranjo, A. [2012], 'Credit Constraints in Education', *Annual Review of Economics* **4**, 225–256.

Martinelli, C. and Parker, S. W. [2009], 'Deception and misreporting in a social program', *Journal of the European Economic Association* **7**(4), 886–908.

McCrary, J. [2008], 'Manipulation of the running variable in the regression discontinuity design: A density test', *Journal of Econometrics* **142**(2), 698–714.

Mizala, A. and Urquiola, M. [2013], 'School markets: The impact of information approximating schools' effectiveness', *Journal of Development Economics* **103**(C), 313–335.

Pathak, P. [2011], 'The Mechanism Design Approach to Student Assignment', *Annual Review of Economics, Annual Reviews* **3**(1), 513–536.

Skoufias, E., Davis, B. and de la Vega, S. [2001], 'Targeting the Poor in Mexico: An Evaluation of the Selection of Households into PROGRESA', *World Development* **29**(10), 1769–1784.

Wiswall, M. and Zafar, B. [forthcoming], 'Determinants of college major choice: Identiöcation using an information experiment', *The Review of Economic Studies.* .

Figures

Figure 1: The Geographic Distribution of COMIPEMS Options
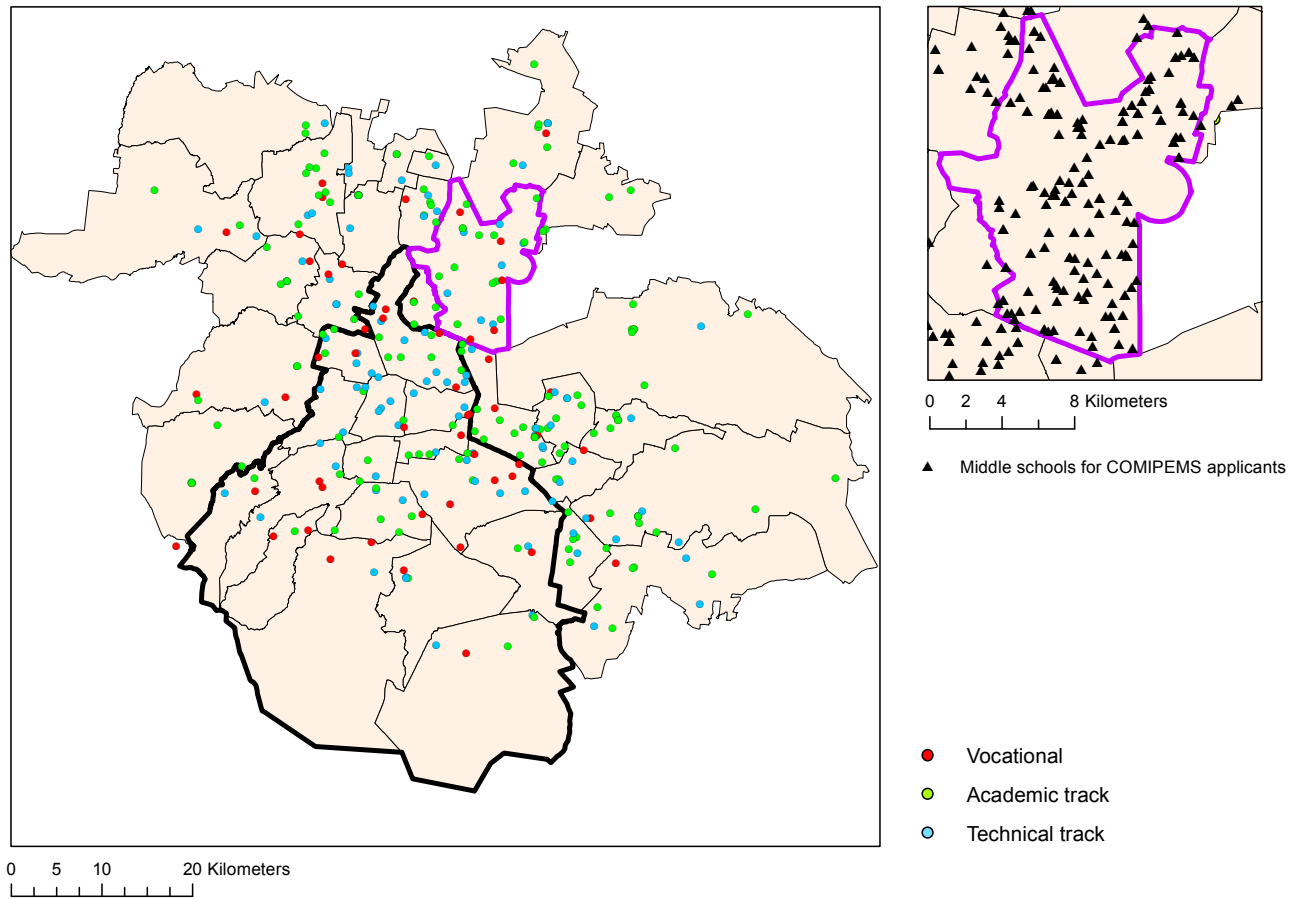
NOTE: This map reports the geographic locations of the schooling options that participate to the COMIPEMS assignment system during the period 2005-2010. The quadrant in the up-right corner displays a close-up view of the Municipality of Ecatepec in which the markers reflect the locations of the middle-schools of origin for the applicants in our sample.

Figure 2: Density of the Program Eligibility Score
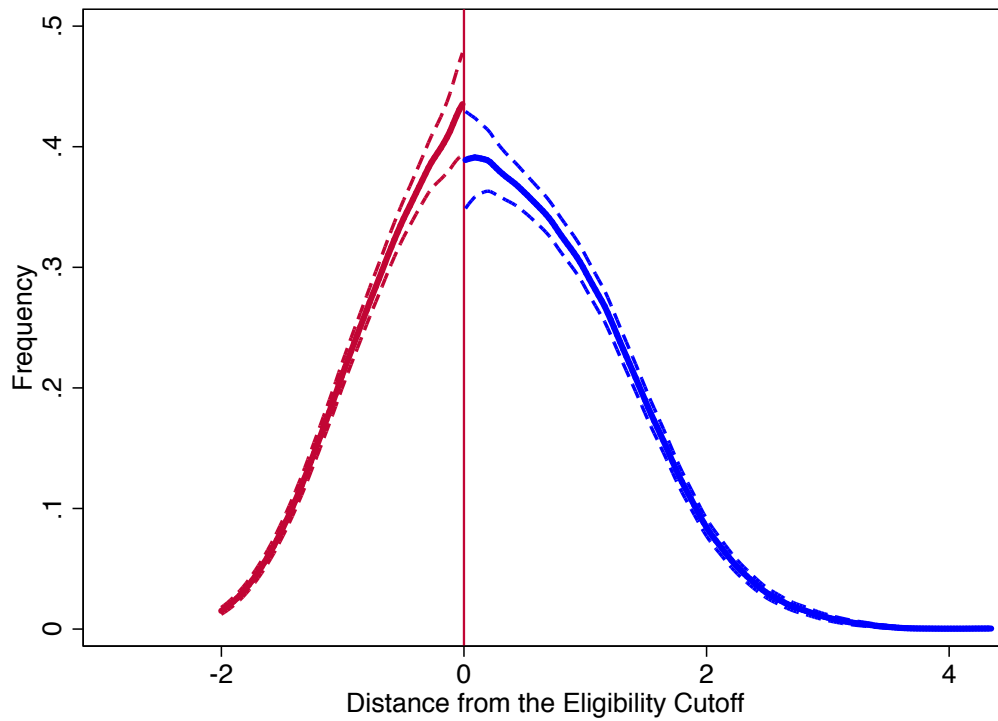
NOTE: This figure depicts a kernel regression interpolation along with the confidence intervals of the empirical distribution of the assignment variable at the points below and above the cutoff. The bin size and the optimal bandwidth are calculated using the procedure described in McCrary [2008].
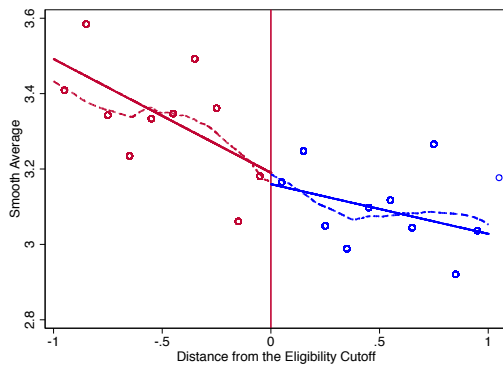
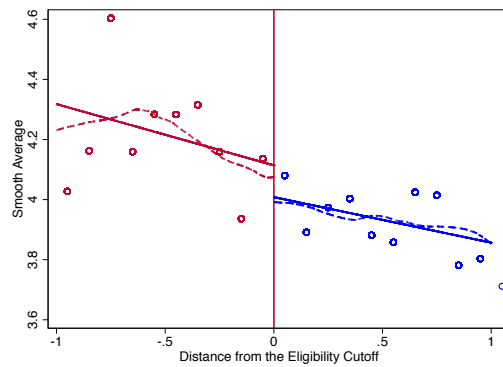Figure 3: Continuity Tests for Covariates
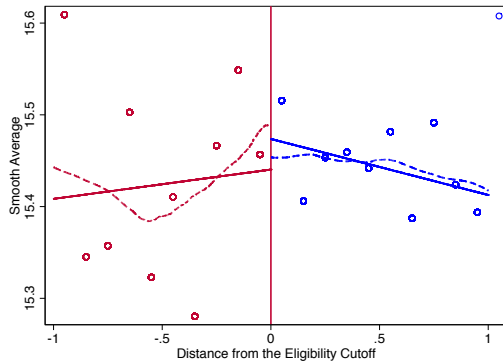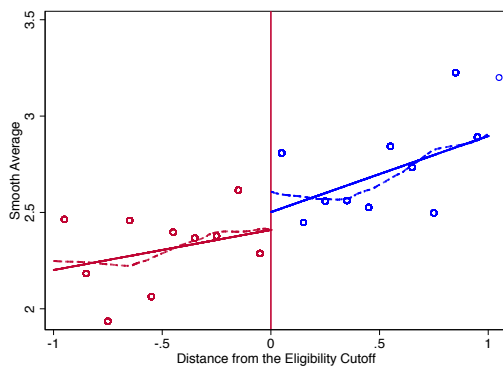
(a) Age
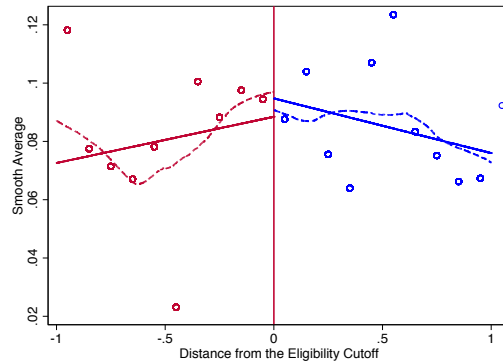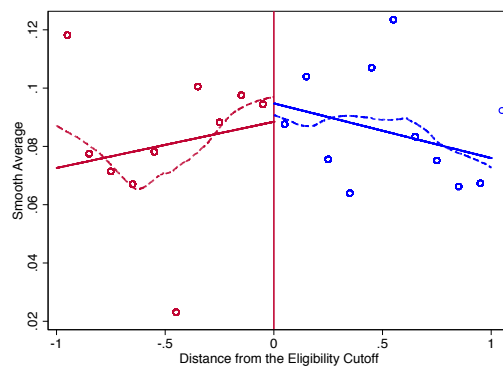
(b) Ethnicity (indigenous)

(c) Household Monthly Income (categorical)
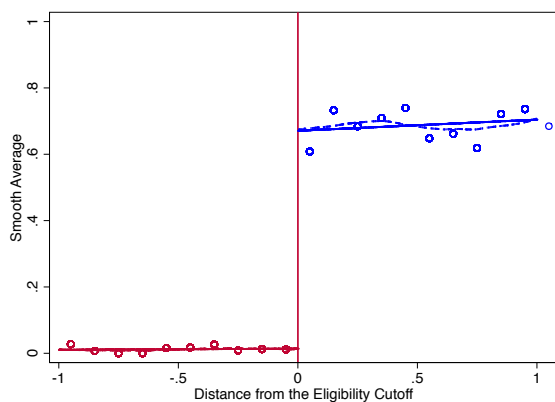
(d) Parental Education (categorical)

(e) Number of Siblings

(f) Live with Both Parents

NOTE: Circles represent sample averages of the dependent variable computed on 0.10 point brackets of the running variable. The solid line (dashed line) is a local linear regression prediction (least squares running-mean smoothing), separated on either side of the threshold. For presentational reasons, the figure plots averages of the dependent variable with values of the running variable comprised between -1 and 1. The red vertical line denotes the discontinuity, normalized to zero.

Figure 4: Discontinuity Effects of Program Eligibility on Track Choice

(a) Program Take-up

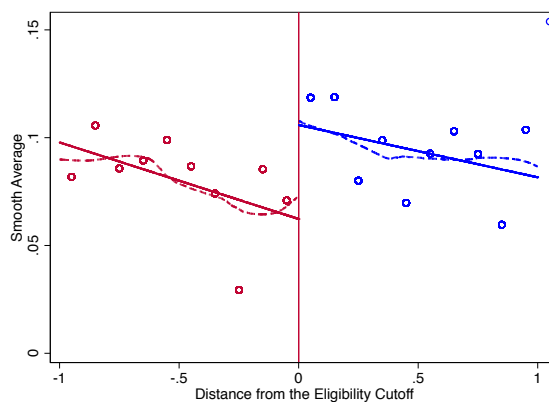(b) Vocational Track (1st option)
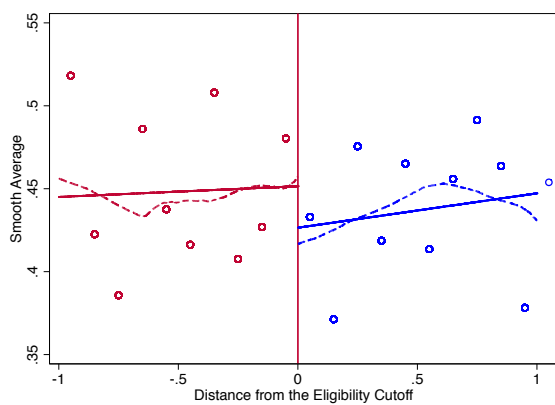
(c) Technical Track (1st option)
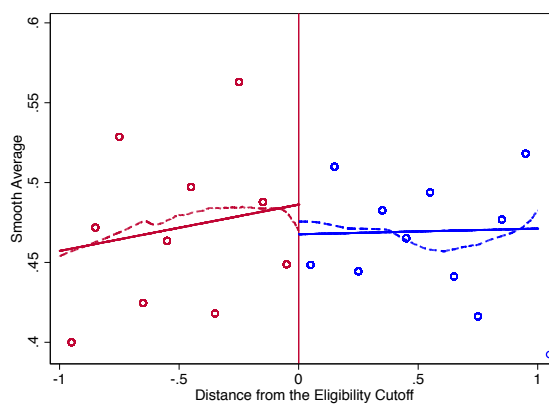
(d) Academic Track (1st option)

NOTE: Circles represent sample averages of the dependent variable computed on 0.10 point brackets of the running variable. The solid line (dashed line) is a local linear regression prediction (least squares running-mean smoothing), separated on either side of the threshold. For presentational reasons, the figure plots averages of the dependent variable with values of the running variable comprised between -1 and 1. The red vertical line denotes the discontinuity, normalized to zero.

Figure 5: Subjective Expectations about Monthly Labor Market Earnings by Track

Figure 6: Type of Preferred Technical Program (1st Option) by Track
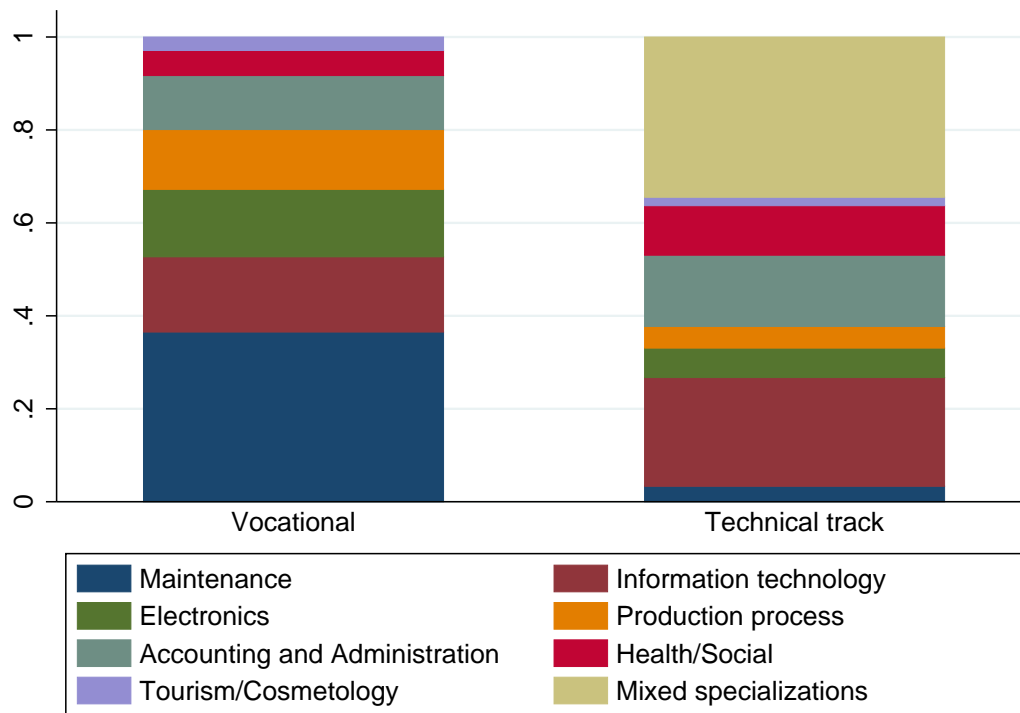
Tables

Table 1: Shares of Upper-Secondary Enrollment in a selected group of Countries

	General	Pre-vocational	Vocational
Argentina	82%		18%
Brazil	86%		14%
Chile	67%		33%
Mexico	91%		9%
OECD average	54%	2%	44%

NOTE: Authors' elaboration based on Education at a Glance 2011: OECD Indicators, OECD, Paris.

Table 2: Effect of the *Oportunidades* Transfer on Track Choices (1st option)

Outcome Variable	Vocational		General		Technical	
Parameter	OLS-ITT	IV-LATE	OLS-ITT	IV-LATE	OLS-ITT	IV-LATE
	(1)	(2)	(3)	(4)	(5)	(6)
Treat	0.040**		0.011		-0.051	
	(0.019)		(0.037)		(0.036)	
Take-up		0.061**		0.017		-0.079
		(0.03)		(0.056)		(0.056)
Mean Dep. Var.	0.092		0.465		0.443	
SD Dep. Var.	0.289		0.499		0.497	
Observations	5232	5232	5232	5232	5232	5232
Clusters	2907	2907	2907	2907	2907	2907

NOTE: * significant at 10%; ** significant at 5%; *** significant at 1%.
OLS estimates (quadratic spline specification for the eligibility score). Standard errors clustered by values of the eligibility score in parenthesis. The dummy variable Vocational/General/Technical takes the value 1 if a Vocational/General/Technical option is listed first in the applicant's portfolio.

Table 3: Alternative Specifications for the ITT Estimates

Outcome Variable	Vocational		General		Technical	
Estimator	LLR-Kernel		LLR-Kernel		LLR-Kernel	
	Triang.	Rectang.	Triang.	Rectang.	Triang.	Rectang.
	(1)	(2)	(3)	(4)	(5)	(6)
Treat	0.046**	0.049**	0.012	-0.001	-0.065	-0.051
	(0.020)	(0.020)	(0.043)	(0.043)	(0.045)	(0.046)
Mean Dep. Var.	0.092		0.465		0.443	
SD Dep. Var.	0.289		0.499		0.497	
Observations	3908	3240	3143	2578	2792	2245
Clusters	2093	1727	1670	1346	1468	1159

NOTE: * significant at 10%; ** significant at 5%; *** significant at 1%.
Local Linear Regression estimates using the optimal bandwidth criterion in Imbens and Kalyanaraman [2012]. Standard errors clustered by values of the eligibility score in parenthesis. The dummy variable Vocational/General/Technical takes the value 1 if a Vocational/General/Technical option is listed first in the applicant's portfolio.

Table 4: Test for compositional changes

Outcome Variable	COMIPEMS (Y/N)	Comipems Score	GPA
	(1)	(2)	(3)
Treat	-0.003	-0.943	-0.248
	(0.017)	(1.298)	(0.173)
Mean Dep. Var.	0.244	57.745	7.352
SD Dep. Var.	0.429	17.584	2.434
Observations	21463	5059	5232
Clusters	6138	2856	2907

NOTE: OLS estimates (quadratic spline specification for the eligibility score). Standard errors clustered by values of the eligibility score in parenthesis. The dummy COMIPEMS takes the value 1 if the individual took part in the COMIPEMS application process, 0 otherwise. The COMIPEMS score is the result of a standardized exam that consists of 128 multiple choice questions. The GPA score reflects results in lower-secondary and varies in the range between 0 and 10.

Table 5: Characteristics of high school Tracks in the COMIPEMS Area

	Academic (1)	Technical (2)	Vocational (3)
Panel a: Benefits and Costs			
Total tuition (MX$ yearly)	3,52	2,64	3,97
	(2,83)	(2,27)	(3,01)
Distance (Km) to the nearest option	1.26	2.01	3.25
	(0.98)	(1.22)	(1.77)
Average distance (Km) to the 10 nearest options	3.88	5.75	8.78
	(1.19)	(1.13)	(2.23)
Labor earnings (hourly MX$) - Secondary	24.36	24.87	27.91
	(21.59)	(22.28)	(28.22)
Labor earnings (hourly MX$) - Tertiary	46.23	44.61	42.08
	(40.90)	(40.90)	(43.40)
Panel b: School Inputs			
Students per PC	22.54	7.75	6.76
	(31.77)	(4.34)	(2.51)
Students per Teachers	18.16	20.46	18.55
	(4.89)	(3.25)	(2.88)
Workshops per student	2.16	2.78	3.63
	(2.59)	(2.66)	(2.48)

NOTES: Sample means using all COMIPEMS school options in 2007, standard deviations in parenthesis. Total tuition costs include: tools, uniforms, monthly payments, registration and tuition. Geodesic distances are computed using the location of applicants' place of residence and the location of all the COMIPEMS options, irrespectively of whether those were listed in the applicants' portfolios. Standard deviations are reported in parenthesis. Labor earnings are computed for individuals between 16 and 35 years old that reside in the States of DF and Mexico who (i) are employed, (ii) went to a public high school in Mexico and (iii) live in localities of 15,000 or more inhabitants.
Source: Mexican School Census and ENTELEMS/ENOE.

Table 6: Treatment Heterogeneity: ITT on the Probability of Choosing Vocational as 1st Choice

	by GPA	by Distance
	(1)	(2)
Treat X Low GPA	0.057***	
	(0.021)	
Treat X High GPA	0.026	
	(0.020)	
Treat X Low Dist		0.025
		(0.021)
Treat X High Dist		0.050**
		(0.022)
P value H_0: Treat X Low=treatX High	0.056	0.134
Mean Dep. Var.	7.352	3.247
SD Dep. Var.	2.434	1.773
Observations	5232	4893
Clusters	2907	2803

NOTE: * significant at 10%; ** significant at 5%; *** significant at 1%. OLS estimates (quadratic spline specification for the eligibility score). Standard errors clustered by values of the eligibility score in parenthesis. Equation 2 has been estimated allowing for the interaction between the treatment dummy and the dummies for Low and High GPA (column 1) as well as Low and High Distance (column 2). A student is classified as Low(High) GPA if she scored below(above) the median GPA. A student is classified as Low(High) Distance if the distance between her residence and the closest Vocational option in the entire set of available options is below(above) the median geodesic distance.

Table 7: ITT Effects on the Costs of the 1st Choice

Outcome Variable	Log Total Tuition Fees			Distance from Residence (Km)		
Estimator	Quadratic Spline	LLR Triang.	LLR Rectang.	Quadratic Spline	LLR Triang.	LLR Rectang.
	(1)	(2)	(3)	(4)	(5)	(6)
Treat	0.076*	0.090*	0.107**	0.559	1.490**	1.633**
	(0.045)	(0.049)	(0.050)	(0.476)	(0.718)	(0.714)
Mean Dep. Var.	7.993	7.979	7.973	8.242	8.379	8.311
SD Dep. Var.	0.524	0.527	0.528	6.205	6.178	6.205
Observations	3507	2120	1738	4756	1867	1497
Clusters	2245	1320	1075	2768	1007	806

NOTE: * significant at 10%; ** significant at 5%; *** significant at 1%.
Standard errors clustered by values of the eligibility score in parenthesis. Total tuition costs fees: tools, uniforms, monthly payments, registration and tuition. The geodesic distance is computed using the location of applicants' place of residence and the location of the 1st option.

Table 8: School Selectivity of the 1st Choice

Dependent Variable	Admission Cutoff			EMS Spanish			EMS Math		
Estimator	Quadratic Spline	LLR Triang.	LLR Rectang.	Quadratic Spline	LLR Triang.	LLR Rectang.	Quadratic Spline	LLR Triang.	LLR Rectang.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treat	-0.954	-0.641	-0.548	-0.021	-0.051	-0.038	-0.023	-0.045	-0.034
	(1.519)	(1.523)	(1.547)	(0.043)	(0.047)	(0.048)	(0.057)	(0.058)	(0.060)
Mean Dep. Var.	67.996			0.372			0.413		
SD Dep. Var.	20.330			0.522			0.694		
Observations	5143	3939	3305	3792	2480	2054	3792	2807	2309
Clusters	2875	2133	1777	2386	1522	1238	2386	1721	1414

NOTE: * significant at 10%; ** significant at 5%; *** significant at 1%. Standard errors clustered by values of the eligibility score in parenthesis. Admission Cutoff is the lowest COMIPEMS score among students admitted to the option listed as first. EMS Spanish and Math represent the 2008 school average 12th grade ENLACE in Math and Spanish

40

Table 9: Placement Outcomes and Medium-Term Outcomes

Dependent Variable	Assignment to the 1st Choice (Y/N)			ENLACE 12th grade in Vocational (Y/N)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treat	0.040	0.053		0.010	0.008	
	(0.038)	(0.036)		(0.020)	(0.021)	
Treat X Low Distance			0.043			0.004
			(0.040)			(0.021)
Treat X High Distance			0.081**			0.038*
			(0.041)			(0.021)
COMIPEMS score deciles fixed effects	No	Yes	Yes	No	Yes	Yes
P value H_0: Treat X Low=Treat X High			0.199			0.045
Mean Dep. Var.	0.372	0.372	0.375	0.080	0.082	0.082
SD Dep. Var.	0.483	0.483	0.484	0.271	0.275	0.274
Observations	4234	4234	3940	5232	5059	4726
Clusters	2592	2592	2488	2907	2856	2752

NOTE: * significant at 10%; ** significant at 5%; *** significant at 1%.
OLS estimates (quadratic spline specification for the eligibility score). Standard errors clustered by values of the eligibility score in parenthesis. The dummy Assignment to the 1st Choice takes the value 1 if the student is assigned to the first option listed in the portfolio, 0 otherwise.